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East Europe Report

SCIENTIFIC AFFAIRS

No. 668

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POLISH-SOVIET SCIENTIFIC COOPERATION DESCRIBED

Warsaw NAUKA POLSKA in Polish No 8, Aug 79 pp 3-13

[Article by Jan Kaczmarek, Full Member of the Polish Academy of Sciences: "Scientific Cooperation Between the Polish Academy of Sciences and Academy of Sciences of the Soviet Union"]

[Excerpts] Principles and Methods of Scientific Cooperation With Socialist Countries

A long, 30-year period of cooperation between the Polish Academy of Sciences and the academies of sciences of the socialist nations has made it possible to crystallize the principles and methods of this cooperation in the area of development of basic research and performance of other scientific tasks. The first, universally adopted principle is complementarity of cooperation. This signifies that within the framework of multilateral agreements the scientific potential of the cooperating country is a factor in increasing the national potential. Consequently the subject range of research required by a country can be substantially broader than would follow from the capabilities of its own scientific base.

A second principle is cooperative partnership. This follows from the prerequisite of a common ideology of these countries and a community of socialist societies, as well as the conviction that in science, and particularly in basic research, each individual working on a well-chosen and mutually coordinated subject can make a substantial productive contribution. Another important manifestation of partnership in scientific cooperation is the fact that it does not involve financial reckonings based on costings and calculations of the cost and value of projects conducted. This is due not only to the difficulty of making such calculations but also to the conviction that in extended cooperation there exists a high probability of mutual compensation for the value of contributed scientific results.

Conscious rejection of financial settlement is not contrary to the next principle of cooperation, that is, seeking of mutual benefit. The principle of mutual benefit is manifested particularly in the fact that each cooperative research topic meets the condition of being in the national plan of each country. This means that these are projects which must be conducted even if a cooperative effort were not set up. Of course in such a case a country's own resources and manpower would not always be sufficient. Thanks to cooperation it is possible to achieve a broader program of research needed by a country than would be permitted by that country's own resources and scientific manpower.

A diversity of forms, defining the level of cooperation, is a characteristic feature of scientific cooperation between the Polish Academy of Sciences and other academies of socialist countries.

Mutual information on research in progress as well as communication of documentation on research project results are the simplest form of cooperation, which can be employed most universally and under all conditions.

Joint planning of mutually determined projects as well as division of tasks among individual cooperating units constitute the form which defines a higher level of cooperation. At this level of cooperation the form of information and communication of results from all projects of interest to the partner should also be employed.

The next form of cooperation is execution of individual topics, on the basis of joint planning, with the aid of international or bilateral teams, in national units. This is connected with the establishment of so-called "base laboratories" for individual cooperative research topics. Such laboratories are established as a rule in units of a high scientific level, with highly-qualified, prestigious scientific cadres, as well as modern research equipment. These are units capable of performing a leadership role.

Of course even at this research level one employs simpler forms of cooperation with research topics which cannot be encompassed by the forms of "base laboratories" or international teams.

Permanent joint scientific facilities are a very effective form of cooperation. In view of a number of conditions which must be met, however, this form can be employed only in a few instances.

Employed in all the above-listed forms of cooperation is a jointly specified obligatoriness of task performance. Agreements, contracts and plans applicable to the specific area of activity are an external expression of this.

In scientific cooperation with socialist countries, considerable attention is focused on personal contacts of scientific personnel. This purpose is served by travel by scientific personnel to visit their partners. A large majority of such trips are carried out on the basis of reciprocity without the use of foreign exchange.

In view of the importance of trips for effectiveness of cooperation, trips have been classified and degrees of priority established.

The most important are trips for the purpose of performance of scientific tasks, that is, primarily basic research. These include projects aimed at discovery of new phenomena, determination of or gaining detailed knowledge of the laws governing such phenomena, as well as optimization of obtained results for practical application. This group includes travel connected with professional consultations and forecasts, joint publications, as well as authoring of textbooks, etc.

Travel for the purpose of scientific personnel training is assigned the next priority in order of importance. In actuality it is rarely necessary to apply this priority, for as a rule training of scientific personnel is connected with performance of specific joint research projects. There are justified instances, however, where training and specialization of scientific personnel are designated as the main reason for travel.

Conferences and scientific congresses are the third priority for making travel decisions. These usually involve visiting scientific facilities as well as personal scientific consultation in the conference host country.

Organizational and official travel constitutes the last travel group. The number of such trips and travelers is limited to the essential minimum.

Stages of Development of Cooperation Between the Polish Academy of Sciences and the USSR Academy of Sciences

A new, third period of cooperation between PAN [Polish Academy of Sciences] and the USSR Academy of Sciences began in the 1960's. Beginning in 1962, with the support and participation of the USSR Academy of Sciences, multilateral cooperation among the academies of the socialist countries began at the initiative of PAN. Additional project topics proceeding from multilateral cooperation were added to the previous problems being worked on jointly with the Soviet Academy. There began to appear forms of cooperation with distinctive features of partnership, which in time became the dominant form in relations between PAN and the USSR Academy of Sciences. In this period results of cooperative effort in the area of basic research began to find practical applications with increasing frequency. One could cite here as an example results of research in the area of physical chemistry, which was utilized in a practical manner to combat corrosion of metals, as well as results in mathematical, physics and cybernetics research, utilized in building electronic computers.

Full development of cooperation between PAN and the USSR Academy of Sciences, which reflects all the principles and methods of cooperation discussed in the introductory section of this article, occurred in the final years of the 1960's and in the 1970's. Our country's scientific policy, specified by the party, especially at the Sixth Congress, and in particular the system of research planning and organization of science, greatly promoted development of a broad front of cooperative effort between the Polish and Soviet Academies. This period is also characterized by the fact that joint planning is dominant in the conduct of research, and also international mixed teams are more frequently beginning to operate at national institutes. The first base laboratories have also been established. Meriting special emphasis is the fact of establishment of a fully international, permanent research center, namely the International Low Temperature and High Magnetic Field Laboratory.

An important role was played by the USSR Academy of Sciences and PAN in the establishment and operation of this laboratory. Another international study and research center in the field of mathematics was established in Warsaw, the Stefan Banach International Mathematics Center.

The present period of cooperation between PAN and the USSR Academy of Sciences is also characterized by the gradual development of cooperation in fields complementing cooperation in basic research.

At the same time the framework of PAN-USSR Academy of Sciences cooperation has been expanded to other partners, beyond the organizational system of both academies. The principle that each academy can mediate and assist in setting up cooperation by the other academy on domestic soil has been adopted and is being implemented. This method brings PAN great advantages, since it permits cooperation with other Soviet academies of sciences, such as all-union specialist academies (agricultural sciences, medical sciences, education sciences) as well as republic academies. In Poland PAN helps set up and carry out cooperation between the USSR Academy of Sciences and scientific units of higher educational institutions as well as ministerial scientific research institutes.

Survey of Results of Cooperation in Basic Research in the 1970's

The magnitude of cooperation between the Polish and Soviet Academies was specified in the agreement for the current five-year plan at 72 problems and 108 research topics, comprising an integral part of the national basic research plans. To this we should add bilateral cooperation of PAN and the USSR Academy of Sciences in multilateral cooperation on 18 combined problems specified in the "Program of Multilateral Cooperation Among the Academies of Sciences of the CEMA Nations." Polish-Soviet cooperation between both academies is also broadened by participation in the activities of the international research centers of the CEMA member nations. We should mention here both centers located on Polish soil (The Banach Mathematics Center and the International Low Temperature and High Magnetic Field Laboratory) as well as the International Heat and Mass Exchange Center in Minsk and the International Electron Microscopy Center in Halle.

Of great significance for development of cooperation with the USSR Academy of Sciences and with other academies of the socialist nations was establishment of a specific form of coordination of multilateral and bilateral cooperation -- periodic conferences of academy vice-chairmen in charge of scientific activities in the social sciences disciplines. This was an initiative of the USSR Academy of Sciences, to which all academies responded with full support and commitment. The first conference was held by the

USSR Academy of Sciences in 1975. The next conference, in 1976, was held in Poland. A result of these conferences was elaboration and adoption of a "long-range program of scientific facilities of the socialist nations in the area of the social sciences."

The first results proceeding from this program were discussed in April of this year at the Third Conference, organized by the Hungarian Academy of Sciences. New social sciences tasks were also specified, proceeding from the most recent conference of secretaries for ideological affairs of the central committees of the brother Communist and worker parties of the socialist nations.

The state of progress in Polish-Soviet cooperation in the area of the social sciences indicates that we can anticipate in coming years results equal in value to those which have already been achieved.

These include projects covering study of the historical conditions of development of our people and nation, formation of a scientific philosophical outlook, and government from the standpoint of evolution of law, development of national culture in its various aspects, etc.

Further development of cooperation in the area of the social sciences will be promoted by establishment of a special scientific information system. All academies of the socialist nations are participating in this endeavor, with PAN playing a particularly active role.

Cooperation in the area of the exact and technical sciences increases not only the store of theoretical knowledge but also has great significance for many sectors of the national economy.

Among the results of projects in recent years, one can cite as an example successfully completed research on the fine structure of electrolytically hydrogen-saturated nickel. This research was conducted by the institutes of physical chemistry of PAN and the USSR Academy of Sciences. In the area of radiation chemistry, equipment for photolysis in the vacuous ultraviolet region and radiation source spectroscopy methods were jointly developed.

A result of cooperative research on the topic "Investigation of the Magneto-Optical Properties of Optical Materials," conducted jointly by the PAN Institute of Physics and the Ukrainian SSR Academy of Sciences Physics-Technical Institute of Low Temperatures, was the discovery of phase domains induced by a magnetic field in orthoferrites; the obtained results were reported in two joint publications. Within the framework of cooperation between the PAN Institute of Physics and the USSR Academy of Sciences Physics-Technical Institute imeni Ioffe, the parameters of a nuclear resonance spectroscope designed for studying magnetic materials across a broad frequency range were elaborated and optimized. Conducting cooperative research in the area of spectroscopy of electron paramagnetic resonance of superconductor hydrides, the PAN Institute of Low Temperatures and Structural Research and the USSR Academy of Sciences Kazan'

Physics-Technical Institute conducted joint research on hydrides of f-electron elements and palladium by EPR (Electron Paramagnetic Resonance) methods. The results of these investigations were reported in two publications.

The PAN Institute of Basic Problems of Technology and the USSR Academy of Sciences Institute of Problems of Mechanics conducted joint research on employment of lateral discharge controlled by a nested electrode, in molecular gases for pumping high-pressure lasers.

Within the framework of cooperation in the area of mechanics of solids, work was completed on a method of determining the dynamic characteristics of strengthening a material in a plastic state. Progress was also made in theory and experimental investigation of large elastic and plastic structural strains. This is reflected in a jointly prepared publication on large deformations of mechanical systems.

Within the framework of cooperation between the PAN Fundamentals of Metallurgy Establishment and the USSR Academy of Sciences Institute of Physical Chemistry, a study was made of the influence of electrochemical parameters on the kinetics of precipitation and the magnetic properties of Ni-Co alloys. The results obtained from the joint research (reported in three publications) are of considerable importance for closer investigation of the conditions of electrolytic precipitation of Ni-Co alloys with specified properties. In view of the increasing employment of magnetic alloys in the electronics industry, the results of these investigations can be given a very positive rating.

We particularly value our cooperation with Soviet science in implementation of the Interkosmos Program. In 1973, for example, an important event from the standpoint of Polish participation in the program was successful accomplishment of the "Copernicus 500" experiment; a piece of Polish-designed equipment was launched into orbit on board the Interkosmos-Copernicus 500 satellite -- a radiospectrograph for recording sporadic solar radio emissions in the fm band. We also note important achievements in joint solar studies pertaining to X-radiation in the region from 4 to Å (angstroms).

In the last few years there has been a substantial increase in participation by Polish science in multilateral and bilateral cooperation with the USSR Academy of Sciences in the area of space research. The work done by our scientists is increasingly valued. One indication of recognition of Polish achievements is the USSR Academy of Sciences certificate awarded to the PAN Computer Center for a method and algorithm of computation of the ephemerides of satellites. Theoretical solution of the problem of the effect of gas on a wall under conditions of space was similarly honored.

In the historic flight of the first Polish cosmonaut-scientist, Maj Miroslaw Hermaszewski, Polish scientific facilities not only took part in the extensive research program prepared by all partners in the Interkosmos Program but also prepared five of their own experiments. These included a very important experiment dealing with crystallization of a ternary semiconductor alloy, as well as important research in the area of the medical sciences.

Further plans and undertakings by Polish science in the area of utilization of space flights are extensive. Proceeding from the presumption of peaceful utilization of earth orbital flights, planned research includes earth and space studies, studies on the development of space hardware as well as various research experiments in many scientific disciplines under conditions of space. This will be promoted by accelerated development of medicine, physics and chemistry, remote sensing and radio engineering, geodesy and cartography, geology and geophysics, meteorology, astrophysics and astronomy.

We shall end our examples of cooperation in the area of the exact and technical sciences with a brief report on cooperation between the PAN Geological Sciences Establishment, the USSR Academy of Sciences Geological Institute and the Estonian Academy of Sciences Institute of Geology. A published study on stratigraphy of Late Precambrian and Lower Paleozoic sediments is of great significance for geological identification of border areas of Poland and the USSR. The PAN Parasitology Establishment and the USSR Academy of Sciences Helminthology Institute are productively cooperating on the topic "Biological Problems of Parasitism." Within the framework of this cooperation, the energy and trophic metabolism of cestodes as well as their evolutionary forms have been described, and studies have been conducted on the physiological and biochemical adaptations of nematodes to their environments. These studies are both of a basic research nature and can also contribute to the investigation of effectiveness of anti-helminth preparations. Performance of research simultaneously involves training of qualified specialists in the area of physiology of parasites for both establishments.

In the area of the basic biological sciences as well as agricultural-forestry and medical sciences, cooperation is developing in several areas and is producing more and more new results which are of scientific value and of practical use.

In a close link with the exact and technical sciences, cooperation is developing in the area of construction of highly-specialized custom research equipment.

This area of cooperation was the subject of a special conference of chairmen of the academies of the socialist nations in 1977. Duly appraising the exceptionally important, sometimes decisive role of measurements essential in research as well as development of the scientific research equipment industry in the socialist countries, which is not meeting the requirements of science, a resolution was adopted at the conference, on means and methods to speed up the rate of growth of equipment manufacture. The main thesis of this resolution is that organizations of the academies proper should engage in the manufacture of highly-specialized research equipment, for the uniqueness, suitability and level of sophistication of such equipment depends on a close link with the scientists themselves, who as a rule are the originators of new equipment ideas and designs.

It is demanded that an increase in the productivity of equipment manufacture and improvement in equipment quality be attained through socialist division of labor in production, that is, production specialization by the individual academies, and in this manner an increase in the total number of units produced. An increase in the total number of units produced is the key to boosting the level of manufacture and production profitability.

Also specified is extensive development of cooperation with the monitoring and test equipment industry, electronics and precision engineering industry, for the purpose of providing support to research equipment manufacture with requisite parts and assemblies.

PAN proceeded with implementation of this program in 1978. Formal agreements have already been reached on specialization and mutual supply between the USSR Academy of Sciences and PAN, as well as with other academies of socialist nations, agreements which in these coming years should positively and appreciably improve research equipment supply.

Within the framework of cooperation between the PAN Mammal Research Establishment and the USSR Academy of Sciences Institute of Biology of Development on the problem "Features of Individual Growth and Development of Vertebrates," publications on population variability of vertebrates as well as biology of growth cycles and methods of age determination have been prepared.

The main objective of cooperation between the PAN Ecology Institute and the USSR Academy of Sciences Institute of Oceanography is a bioenergetic evaluation of the growth and propagation parameters of aquatic organisms of differing ecological value. Within the framework of this cooperation, in 1978 people from the PAN Ecology Institute took part in a Pacific Ocean voyage by the Soviet research vessel "Dmitriy Mendeleyev." This expedition produced many useful research results, which will be subjected to thorough analysis and then put to practical application. Also planned is participation by scientific personnel from the USSR Academy of Sciences Institute of Oceanography in research conducted at the PAN H. Arctowski Antarctic Station.

Cooperation between the PAN Institute of Ecology and the USSR Academy of Sciences Institute of Oceanography dates back many years. In 1974 Polish ecologists took part in a scientific voyage of the Soviet research vessel "Academician Kurchatov" to the equatorial region of the Pacific and to the Peru Current. The results of joint Polish-Soviet investigations on this expedition were published in 1975 in the form of five scholarly papers and comprise a valuable contribution to world hydrobiological research. The PAN Ecology Institute also initiated collaboration with the Belorussian SSR Academy of Sciences Institute of Zoology and Parasitology on the problem "Ecological-Physiological Description of Thermal Feeding and Growth Adaptations of Plankton Organisms." Within the framework of this collaboration the bioenergetic parameters of the planktonic crustacean comprising the principal constituent of so-called krill were elaborated.

As an example illustrating research cooperation in the area of the medical sciences one can cite results achieved by the PAN Center for Medical Research and Clinical Medicine and the Georgian SSR Academy of Sciences Institute of Physiology. Joint research produced important information on the pathomechanism of damage to the central nervous system caused by ischemia of the brain in conditions of diseases of the vascular system. The results of these studies can find application in preventive medicine and clinical treatment of diseases connected with hypoxemia (injuries, brain tumor, etc).

Further Improvement and Increased Effectiveness of Cooperation

It follows from the above partial review, with illustrations, of results achieved in recent years from research cooperation between PAN and the USSR Academy of Sciences that it is becoming increasingly more concrete and effective.

While mentioning the positive aspects of past cooperation with the USSR Academy of Sciences, one must also note the possibilities of further expansion, further streamlining and increased effectiveness.

Therefore at the beginning of 1978, when PAN officials began a new term in office, proposals were submitted to the USSR Academy of Sciences, containing initiatives aimed at a substantial increase in the effect of cooperation in the area of basic research and other scientific projects for the development of science as well as practical social and economic activities.

This objective should be promoted by even better adaptation of the subject matter and scope of cooperation to science's development needs and practical social and economic activities, as well as increased research potential and better utilization of this potential.

In the area of further improvement of topic selection and scope of cooperation, it is necessary to adapt them better than up to the present time to the development priorities of science and practical application. This means that the list of cooperative research topics will be periodically analyzed and modified in order to achieve results which will assist and catalyze development of priority areas. The following topic areas apply to national socioeconomic development: food and nutrition, housing, "market" development, health, cultural development, energy, raw materials and other materials, development of productive resources, export, defense and national security.

We should emphasize that the scientific discipline development priorities specified for Poland by the Second Polish Science Congress will also be observed with equal importance.

Examining research from the standpoint of its cognitive and practical importance, we shall certainly be able to postpone or even eliminate some research topics. The research potential obtained from this can be directed toward cooperative research topics of considerably greater scientific significance, especially since they can affect to a high degree development in the area of socioeconomic priorities.

Without prejudging the final determinations of both academies, it would seem necessary in bilateral cooperation plans to expand the list of research projects by adding problems pertaining to carbochemistry, determination and rational utilization of the biological and mineral resources of Arctic areas, management of water resources, as well as broadening of bilateral cooperation in space research.

Proposals for the immediate and long-range future also specify substantially expanded exchange of information on research projects which are not included in cooperative research plans but which are a matter of interest to both parties.

PAN proposals also apply to adoption of joint elaboration of selected professional reports and scientific forecasts in cooperative research plans.

As practical experience indicates, they are a relatively inexpensive, fast and effective instrument of influence by science on a country's comprehensive development. For in preparing professional reports one utilizes previously-amassed knowledge, both in this country and abroad. Cooperation in this area would encompass the following: exchange of prepared professional reports and forecasts; when necessary, mutual presentation of opinions and joint preparation of professional reports and forecasts pertaining to important problems in the area of socioeconomic development, as well as development forecasts and programs for individual scientific disciplines.

Several proposals were also submitted in the area of increasing scientific potential and better utilization of this potential in bilateral cooperation.

First of all, it will be possible to increase the number of cooperating personnel potentials by including to a much greater degree in bilateral cooperation the scientific research establishments of economic ministries and higher educational institutions.

Cooperation potential can be increased by even greater involvement of USSR republic academies of sciences in problem teams, and in particular the academies of the republics adjacent to Poland. Extensive dissemination of the method of execution of research projects by mixed (international) teams in the institutes of one of the partners can possess great significance for increasing collaboration effectiveness.

In view of difficulties in furnishing modern scientific research equipment, it has been proposed that appropriate organizational capabilities be created for providing access to or even loaning equipment to cooperative project partners.

Another proposal involved adoption of "scientific self-monitoring and self-evaluation," specific and approved by the Polish Scientific Center. What this means is seminar methods of consultation and evaluation of research projects by appropriate scientific teams.

It was also proposed that greater attention be focused on streamlining scientific information on joint projects in progress. It is proposed that the "signal information" system which is successfully operating in Poland be applied to bilateral PAN-USSR Academy of Sciences cooperation. Also proposed was periodic publication of so-called "collections of papers," which would contain scientific reports on cooperative research topics covering a given problem.

All these proposals will require more flexible utilization of funds allocated for bilateral cooperation from scientific research funds in both countries. Precisely such proposals have been submitted.

Also anticipated is establishment of a system of monetary rewards for the authors of joint projects distinguished by cognitive and utilitarian value.

USSR Academy of Sciences officials carefully and thoroughly examined the PAN proposals, recognized the PAN intentions as correct, and essentially adopted all proposals.

At the same time the USSR Academy of Sciences enriched and further refined the proposed plans discussed above. Thus USSR Academy of Sciences officials once again confirmed the aspiration to achieve the greatest possible development of cooperation and collaboration with Polish science. An attitude of good will on both sides, mutual understanding of needs and capabilities which characterizes PAN and the USSR Academy of Sciences gives reason to express the conviction that under conditions of increasingly fine cooperation there will be successful development of scientific productivity and its effective influence on the cultural, social and economic development of Poland and the USSR.

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NUCLEAR PHYSICS RESEARCH IN SERVICE TO ECONOMY

Tirana BASHKIMI in Albanian 14 Jan 80 pp 1, 2

[Interview with Docent Skender Koja, director of the Nuclear Physics Institute, by Pali Koxhioni, editor of BASHKIMI: "Scientific Experiments in Service to the Economy"]

[Text] In their letter to the editorial office, a group of BASHKIMI readers from Skrapar District want to know about the work and scientific activity of the Nuclear Physics Institute in assistance to the various sectors of the economy. For this reason our editor Pali Koxhioni interviewed Docent Skender Koja, director of this institute, who said:

The Nuclear Physics Institute of our country was created in 1971 on the basis of the scientific activities previously carried out in some faculties of Tirana University. We have progressed from year to year in the field of expanding scientific work through the many experiments which have been carried out and which continue to be carried out. Today, the science of nuclear physics is being used in many practical applications through scientific experiments in the service of the people's economy. It is important to emphasize the cooperation and coordination of our work with other scientific institutions and various production enterprises.

In fact, here are some of the directions of the scientific activity of the Nuclear Physics Institute: by utilizing gamma rays of an electrostatic accelerator, it is possible to obtain the radiation of some biological materials for various purposes in agriculture, for example, for the stimulation of seeds before sowing, for the study of the consequences of radiation on the preservation of some agricultural products and for the creation of larva vaccines against parasites in livestock and so forth. Also, with this method, it is possible to obtain the radiation of the sheets of polyethylene with electronic tufts, under the action of which polyethylene acquires new physical qualities which present a practical interest for some industrial branches.

Other nuclear physics methods make it possible to carry out other important studies in the service of hydrotechnical constructions in the field of hydrogeology. For example, by the means of radioactive trackers, it is possible to make the measurement of the alluvium of rivers and the measurement of parameters of underground waters and so forth. By means of radioactive trackers, it is also possible to find the most rational ways for the fertilizing of lands in agriculture. A group of specialists of this institute, in cooperation with other scientific cadres of agricultural institutions, are continuing their studies on the most effective use of phosphate fertilizers for wheat and corn crops in agricultural soils. By means of isotopic methods, it is possible to determine the quantity of assimilable phosphorus contained in the various agricultural soils.

Of great value are the study expeditions undertaken by the specialists of the institute in the coastal shallow area where the new port of Vlore will be built. The results of this study present a great interest for the designers of this port. The idea of this study is to put radioactive sand in some places of the seabed and to follow its movement, as well as to monitor the factors that cause this movement. Other methods of nuclear physics, such as, for example, the method of spectrometric measurements, are of great importance for the petroleum and geology branches. By the means of this method, it is possible to determine the amount of sulphur in the various mineral ores and the absolute geological age of rocks.

In their struggle to put science in the service of our people's economy, the cadres of the institute have gained an experience of many years and have become able to and have started to design and to construct some prototype apparatuses by themselves for the various sectors of industry; in the future, these apparatuses will be reproduced by our electronic plants.

For the geology and petroleum sectors, the institute has implemented some modern nuclear analytic methods which are capable of determining, rapidly and in a sufficiently precise manner, the different chemical elements contained in mineral and petroleum samples. A characteristic of these methods is not only the great rapidity of the analysis, in comparison with the chemical methods, but also the fact that the sample analyzed does not disintegrate during the process of analysis and can be saved in order to be submitted to repeated tests whenever it is necessary. These analytic methods, in some cases, make it possible to determine the elements which cannot be determined with other methods.

These are only some of the fields in which nuclear methods are successfully applied in our country.

9150
CSO: 2102

PROGRESS IN LASERS DEVELOPMENT

Sofia SLAVYANI in Bulgarian No 1, 1980 p 15

[Article by Petur Vladev: "Bulgarian Lasers"]

> [Text] There have been few discoveries such as that of the lasers, whose application is spreading like explosions. Today they are being endlessly discussed and written about. They have been applied in just about all areas of life and their possibilities seem unlimited. Yet, they are the product of a young science--quantum electronics.

We discussed electronics with Vasil Stefanov, senior scientific associate, candidate of physical and mathematical sciences, and head of the Quantum Electronics Sector of the Bulgarian Academy of Sciences Institute of Electronics. How is quantum electronics developing in Bulgaria? What is its application? It was rapidly mastered and initial results were very fast to come by. V. Stefanov looked at them and at the time of the sensational discovery of the laser.

"Two years following the discovery of the laser we undertook studies in the field of quantum electronics. I became familiar with this science in the course of my contacts with Soviet scientists. Two years later, or four years following the invention of the laser, we developed a Bulgarian ruby laser. It was commissioned and immediately used for research in spectroscopy."

Senior Scientific Associate V. Stefanov spoke on behalf of his section. However, we should specify that it was he who designed the first Bulgarian laser.

Today new types of lasers are being discovered continually. Our quantum electronics is trying to keep up with global achievements.

"We are studying laser physics," V. Stefanov added. "We are focusing on various gas lasers: helium-neon, argon, nitrogen, carbon dioxide, or combined gas mixes. We are also studying retuning color lasers."

Since the time of the building of the first Bulgarian laser about 30 authorship invention certificates have been registered. For example, the series of reflectors has a broad range of application: in photochemistry, solar heating of ring-shaped particles, excitation of ring-shaped light conductor lasers, excitation of lasers for radiation furnaces and photochemical reactors, and others. The system for modulating a gas laser may be used to carry information or conduct measurements. Lasers with a helium-neon mix and cadmium vapors is applied in holography, in a variety of measurements, and so on. The system for obtaining a slice with intensive pre-ionizing in a pulse tube may be applied wherever a high intensity light pulse is needed with a fast expansion of the front area such as, for example, in laser technology, photochemistry, and so on.

Within a short time our quantum electronics have acquired great potential. Today the development of laser technology is considered a strategic direction in Bulgarian science. Its unique opportunities have been properly assessed, for Bulgarian lasers have already become irreplaceable assistants in material production and in improving practical applications in other sciences. A laser sight for surveyor work has been developed and successfully applied in Bulgarian mines. Experiments have been conducted in the field of laser surgery at the Oncology Institute. Together with Prof Boyan Boyanov, from the dentistry chair of the Medical Academy, a laser for experimental research has been developed. Together with the Bulgarian Academy of Sciences Institute of Plant Physiology encouraging experiments have been made to increase the germination of seeds treated with laser radiation. Successful experiments have been conducted in cutting textile fabrics, timber, cardboard, glass, ceramics, plastic glass, plastics, and other materials.

These are the scales reached so far. What lies in the future?

"The most important thing is for the production of Bulgarian lasers to come out of our laboratories. Quantum electronics offers a direction which is exceptionally promising and of great importance to technical progress in our country. In the next few years decisive steps will be taken to organize the production of laser equipment."

5003
CSO: 2202

NEW PRODUCTS OF PRINTED CIRCUITS PLANT IN RUSE

Sofia ECONOMIC NEWS in English No 1, 1980 p 7

[Text] The country's specialized plant for printed-circuit plates in Rousse, N.E. Bulgaria, enjoys very good reputation on the home market and with customers in the Soviet Union.

The first products which won the plant high repute were magnetic tapes and magnetic disks based on discrete elements. The annual output was initially of 100 sets. Then followed the adoption of a new process for making printed plates with metallized openings on the basis of integrated circuits, designed for new generations of computers. The production of the Plant is now approximately 20 times larger.

The appearance of third and fourth-generation computers has resulted in the introduction of many new elements in the manufacture of printed plates, which now account for between 40 and 50 percent of the Plant's output.

This year, too, the specialists, engineers and technicians will try to keep abreast with the latest development in the field of computer technique. A number of traditional products have been further improved by the designer's bureau of the Plant, and are being introduced in serial manufacture, together with other novelties.

Among the best known is EC 5012.01, a reliable magnetic tape memory, one of the peripheral units used as an inseparable part of the external memory of many computers. Specialists at the Plant have introduced many improvements in it, to meet most recent scientific requirements. The new modifications EC 5012-03 and EC 5012-04, possess better technical and operational properties. Their higher speed increases the capacity of the external memory.

The EC-5667 control module is designed for a magnetic-disk memory of 200 or 100 MB. The new control module operates as an item of electric equipment which transfers to the memory device the control functions fed in from the control panel.

The products of the Plant already reflect the next stage of scientific and technological progress and, together with the cooperating enterprises, steps are taken to develop a new class of computers based on original components of higher degree of integration. The EC 2435 processor makes it possible to increase 2 to 3 times the speed of operation of computers. New technology makes it possible to pass over to the manufacture of multilayer printed plates--an amazing achievement permitting an increased number of operations by computers smaller in size.

Responsible tasks have been assigned to the Plant during the current Seventh Five-Year Plan (1976-1980). Its output must increase threefold through new methods of making printed plates and components, with a high degree of integration.

CSO: 2020

BULGARIA

ISOT-132D COMPUTER DESCRIBED

Sofia SOFIA NEWS in English 12 Mar 80 p 2

[Article by Ventseslava Todorova]

[Text] Administration and management are swiftly becoming mankind's weak spot today when it must cope with enormous avalanches of information that exceed many times human abilities. In the past 50 years productivity in managerial work has risen only two and a half times, whereas material production has been going through a revolution. The Soviet academician A.I.Berg notes that at these rates, by the end of the century the entire working population will be employed processing information, with no people left for science, production and services. Unless management technologies are also revolutionised, that is

Computers have indeed stepped in to help.

"But computers, big or small, cannot work alone", says eng. Ivan Ivanov, technological deputy director of the typewriter plant in Plovdiv. "There must be certain devices that automatically feed information to these machines and also automatically print the processed information. These already exist: our printers ISOT 132 D do it."

Before I came into the workshop where they are built, I expected to see some extraordinary machines. I was disappointed. All I saw was fitters working deftly with wires, bolts and metal plates, all intertwined, and all inexplicable to me. Engineer Ivanov sensed my embarrassment.

30 printed characters per second

"This is where a modern peripheral device is being assembled", he said. It records commands and instructions in the form of literal digital and sign information on a paper tape. The information is passed from the specialist to the computer and vice versa. In this way an original dialogue goes on. It is here that the printer manifests its "intelligence". When there is a question, it processes part of the answer or takes a decision compatible with the programme fed in it, and thus makes it easy for the computer.

The printer can be linked to systems for the primary processing of information, and to computer terminals.

"The average typing speed is 30 characters per second, which is quick and efficient work indeed.

"Bulgaria is the only country to make this type of printers within the CMEA," the engineers told me. "ISOT 132 D comes in three modifications. One is an input output printer ISOT C 232, with trebled speed, high reliability, which replaces the American teletype printers we used so far. Our printers passed muster in Plovdiv, Riga, Moscow and Kiev. The decision of the Moscow Olympics organisers to have 13 ISOT printers in the information system of the biggest sports forum this year is a recognition for their operational qualities."

Printers get more advanced

"What I learned here was very interesting", I said to engineer Ivanov. "But I am a little surprised, I came to a typewriter plant and you show me printers for much more complex computers."

"What you saw is in fact a variant of the ordinary typewriter", said engineer Ivanov. "The plant started with typewriters, which we continue to make in series."

Perhaps the beginning was very difficult, I thought, because today the requirements are very high, with 34 world famous firms competing in the market.

"The typewriter plant in Plovdiv went into operation in 1967 and is the 35th plant in the world for such machines," engineer Ivanov added.

Cleanliness, order and silence reign in the workshop where the printers are made... The parts are quickly assembled on the conveyor. Various models-of *Maritsa 11223* are made there under the license of the West German firm KUKA. The new model of portable *Maritsa 30* typewriter designed by our experts is also interesting. The electric office typewriters are made under a license of the French firm Jappy. The electro-mechanical machine Hebros 300 soon to be adopted in production is of a new design, too. Production of the improved models Hebros 400 and Hebros 500 will start by 1985. A total of 80 per cent of what the plant makes is exported to the USSR, Poland, the GDR, the FRG, France, Spain, the USA, Mexico and other countries.

CSO: 2020

BRIEFS

EARTHQUAKE IN SLOVAKIA--Mild earth tremors were first registered in Slovakia on 16 March 1980 between 1730 and 1830 hours local time, the epicenter being in the areas of Komarno and Kolarovo. Several tens of additional earth tremors had been registered by 17 March, nine of which were felt by the population of these areas. The strongest tremor reached 4.5 degrees of the 12-degree microseismic scale. Similar earth tremors have appeared in the Komarno area every 5 to 10 years, some lasting several months. The last occurrence took place in 1969. [Prague SVOBODNE SLOVO in Czech 18 Mar 80 p 1]

CSO: 2402

ENERGY PROBLEMS IN RUBBER, PLASTICS INDUSTRY

Gottwaldov PLASTY A KAUCUK in Czech Vol 17 No 1, Jan 1980 pp 6-9 manuscript received 2 Feb 1979

MALIK, Karel, Research Institute of Rubber and Plastics Technology, Gottwaldov

[Abstract] The author attended a meeting, 4-8 December 1978 at Luhacovice, dealing with savings of energy in the Czechoslovak chemical industry and presents a review of the themes which were discussed during the meeting. Problems of the supply of energy and of raw materials were reported to be capable of reduction either by decreasing energy requirements of existing and future production facilities, or by developing new energy sources. Energy consumption in the chemical industry is affected by the nature of the product, difference in the energy content between the raw material and the product, maintaining of the required operating conditions, physical and mechanical treatments of the raw materials, intermediate and final products and by the necessary auxiliary services. Energy consumption is generally higher in the socialist countries than in the West and it is particularly high in Czechoslovakia. Reduction in energy consumption can be achieved by development of improved processes, use of byproduct energy (waste heat utilization), limitation of heat losses, more efficient transportation, adjustments in the heating and cooling and lighting in workshops, and improvements in automation and computer process controls. Usually, energy savings can be achieved by better insulation, control of pressure drops and correct sizing of drivers of rotating equipment.

The author discusses the theoretical requirements of energy in chemical production and introduces his personal concept of "exergy," defined by the equation $e = i - i_o - T_o (s - s_o)$, where i is enthalpy, s is entropy, and the subscript o designates equilibrium conditions between the discussed substance and the surroundings. He deduces that thermal efficiencies of chemical processes should be calculated on the basis of entropies, rather than enthalpies as is commonly done at present. He further deduces that energy losses increase in cost with decreasing process temperatures. The author then states, that, where possible, chemicals which require high energy consumption in manufacturing should be replaced by those having low

energy requirements. A review of thermal efficiencies of production of eight commonly used plastics is given. Some French data for energy consumption in the production of polyethylene and PVC plastics are shown and a statement is made, that Czechoslovak thermal efficiencies are about one half of the French ones, and therefore improvements are needed. The author recommends use of unusual energy sources. In Czechoslovakia, for solar energy, 1500 to 2000 hr/year at an intensity of 1100 KW hr/m^2 can be used. Insulation is very important in this system and applications of plastic materials for nine different purposes in the recovery of solar energy are discussed. In Czechoslovakia, collectors installed on roofs, rather than concentration of rays by mirrors or lenses, should be used. Figures 4; references 6; all Czech.

2573
CSO: 2402

SCIENCE ACADEMY KEY FIGURES OUTLINE GOALS

President on Interdisciplinary Research

East Berlin NEUES DEUTSCHLAND in German 22 Jan 80 p 3

[Interview by Dr Wolfgang Spickermann with Prof Dr Werner Scheler, president, GDR Academy of Sciences: "How Science Is Applied in Practice--200 Research Findings Put Into Practice--490 Patents Applied for"]

[Text] [Question] People speak of the increasing importance of science--are there any examples that illustrate what efficiency increases are possible through the application of the latest findings?

[Answer] There are two examples which I saw during my recent visit to our Central Institute for Solid-State Physics and Materials Research: There is an effective metal cold forming process that can be used in pipe and tube drawing in particular. As compared with conventional technologies, the process makes for considerable increases in labor productivity and at the same time for a sizable reduction in energy input. According to rough estimates, this process will result in economic gains of approximately M 175 million. I am convinced--and I expressed this conviction at the 11th Central Committee plenum--that once the range of application is extended, society will derive even greater benefit from this technological principle.

Research Coordinated With the Partners in Industry

Then there are the experiments concerning the hardfacing of cutting tools. As a result of these experiments, it will be possible significantly to extend the edge life of these cutting tools in operations such as turning, milling, etc. The labor productivity in metal-cutting processes can thus be increased by approximately 10 to 20 percent, while the number of the cutting tools needed can be reduced.

These are prototypical examples of the ways in which progress in basic research can affect production. For these new processes are based on advanced, intensive basic research conducted at this institute: Theoretical and experimental studies on solid-state structures, analyses of phase diagrams of metal alloys, studies on the interaction of structure and properties, etc.

This research work is representative of many other results obtained by the institutes of our Academy. One thing is becoming clear: The link between basic research and production must be further strengthened. In the last few years, the Academy of Sciences has made satisfactory progress in this respect: Approximately one-third of our research projects is coordinated or carried out in collaboration with cooperation partners in industry; some of the projects are based on economic agreements. In 1979, approximately 200 of the Academy's research findings were put into practice and the number of Academy patents applied for increased to approximately 490.

[Question] In this field, what results did you obtain in regard to effective cooperation between Academy researchers and industry?

[Answer] What is important here is a close link between basic research, producers and users. This link is of great value for us, since the results obtained by the producers and users provide feedback for basic research. The link between the Academy and social practice is not a one-way street. On the contrary, in the fields of production and application, there constantly emerge new problems which point to new scientific projects.

In this connection, I would like to draw attention to two problems that we are concerned about. In a number of institutes, the facilities for exploring the technological aspects of new findings produced in basic research are limited. We need to draw on suitable facilities at the disposal of our partners. To some extent, we will expand our own technical-technological potential so as to be able to study research findings with a view to finding basic technological solutions and fields of application.

The second problem, which I would like to emphasize in this connection, is a stepped-up exchange of cadres between industry and institutions of the Academy. One could conceive of various possibilities in this respect. For example, members of the Academy could be transferred to the industrial sector for the purpose of introducing or solving certain problems. The industrial sector should send us more of their experts, who will then be introduced by us to new problems and methods; they can write their doctoral dissertations and they will be able during this time to obtain a general view of the research problems of an entire institute.

Intensification of the Will To Produce

[Question] What is to be done in regard to improving the quality of research results and speeding up the process of putting them into practice?

[Answer] In this respect, the Academy members' intensified will to produce is of crucial importance. This is a concern shared by the political leaders, the party organizations and the trade unions. As far as the scientific work is concerned, the efforts naturally touch all phases of the research process. In regard to our basic research, we must examine again and again whether we are dealing with sufficiently important social problems such as microelectronics, energetics or nutrition or with basic problems concerning our scientific disciplines. It is only through new insights that fundamental breakthroughs in technology and in the development of products and processes are possible.

This is reflected in the competition commitments of the collectives at our institute. At present, there are approximately 100 complex competition programs involving institutes of the Academy, combines and enterprises.

[Question] How do the institutes of the Academy cooperate on basic research with the institutions of the industrial sector?

[Answer] The standards are raised all the time, and there are untapped reserves in the field of joint basic research as well. This applies in equal measure to us and to industry. In keeping with international practice, the industrial sector, too, engages in basic research, if only on problems concerning the individual branch concerned. This also goes for the Soviet Union and other socialist countries and even for capitalist concerns. In accordance with the demands formulated at the 11th Central Committee plenum, both the Academy and industry must close the gap which frequently still exists between basic research and applied and technical research.

[Question] In this connection, how important are interdisciplinary work and the integration of the socialist countries?

[Answer] This is a crucial question. For social needs such as nutrition and the safeguarding of the energy and raw materials supply make demands not only on individual disciplines, but call for complex scientific study. Take energy and raw materials, for example. Chemistry must help develop the most energy- and materials-efficient methods of processing lignite and other sources of energy. As for physics, there are different requirements; I am thinking here of research on nuclear energy, the role of mathematics in the establishment and optimization of integrated energy systems, etc. To solve energy problems, we must also draw on economics and other disciplines. Even the biosciences are involved in connection with the photosynthesis processes or recent hydrocarbon sources.

Division of Labor Across National Borders

Thus it is only through interdisciplinary research that problems pertaining to basic research can be effectively tackled. In this regard, our Academy has to accomplish an important task.

Of great importance is the scientific cooperation among our fraternal countries. There are several problems, the scientific study of which would far exceed the capacities of a single country such as the GDR. I need only mention here space or nuclear fusion research or the problem of microbic protein synthesis from petroleum products. To keep abreast or advance in these fields, our researchers must closely cooperate with the Soviet Union and the other socialist countries.

Significant results have been produced, e.g. in space research and in the fields of molecular biology and chemistry. As is indicated by the agreements to that effect, the trend toward intensified and mutually beneficial research based on division of labor will continue in the next five-year plan.

Vice President on Cooperation

East Berlin NEUE ZEIT in German 5 Jan 80 p 4

[Interview with Prof Dr Ulrich Hofmann, vice president, GDR Academy of Sciences (date and place not given): "Cooperation Between Research and Production Is Urgently Needed"]

[Text] [Question] There is no longer the slightest doubt that the close cooperation between science and production, or more precisely, between research institutes of the GDR Academy of Sciences and various branches of industry, above all industrial combines, is very beneficial for the national economy. If in trying to solve an important problem each side were to pursue its own "independent" course, a lot of time and energy would be wasted. A well-thought-out division of labor succeeds faster, provided that the research and development program is subject to concentrated control.

[Answer] As is shown by many examples, the partnership between industry and science has proved very successful along these lines.

[Question] Professor Hofmann, in an article published in June 1979 you emphasized that the Academy of Sciences--as the largest single research potential of our country--must scientifically lay the ground for the necessary decisions concerning emerging social problems, initiate the necessary developments and also prevent mistakes and develop new economic approaches. You stated that as a result of the cooperation with industry the partners know what research the other side is engaged in, what economically beneficial results can be expected and what kind of research results are needed by industry.

[Answer] We have made great progress in this respect. In 1979, the scientists at our institutes were engaged in approximately 500 research projects based on our Science and Technology Plan. These projects are intended to further scientific advances and to facilitate the implementation of research findings in the national economy. This year, approximately 70 significant findings produced in basic and applied research were presented at the Academy. The number and quality of the contributions intended to insure maximum performance is increasing. In 1978, there were approximately 40 findings of this kind. To cite a few examples, there is the radiation technology for the production of neutron-doped silicon, the development of a copper adhesive, and processes for the production of meat-flavor concentrates.

[Question] What are the researchers of the Academy focusing on?

[Answer] Over 80 percent of the Academy's research potential is focused on problems concerning the following areas of main emphasis: energy base, raw materials and materials base, further development of highly productive processes and technologies, microelectronics, and maintenance and restoration of the people's health. The cooperation with industry and other social areas is reflected in the over 200 economic agreements and approximately 100 complex competition programs that are carried out in collaboration with industry.

[Question] Does this mean that the partners' mutual understanding and their information about each other have likewise increased? Has the search area--a term you used in June 1979--that is to be covered become more transparent?

[Answer] Now as before, it is true that for an efficient utilization of research results it is necessary to coordinate the research projects as much as possible with the requirements of the industrial partners and of other social areas. In this respect, we have been able--primarily on account of the Science and Technology Plan--to make significant progress in the last few years. Generally speaking, this is a difficult task.

At present, a number of economic requirements cannot be met quickly enough by the scientists. On the other hand, we have produced scientific results of immediate applicability, which have so far not been utilized in social practice.

[Question] But even if the research findings are to a large extent in accordance with practical requirements, is it not necessary--for the realization of economic results--first to establish certain preconditions?

[Answer] That is correct. The attempts to open up new sources of raw material, the space research program and the developments in regard to labor-saving technology stimulated metallurgical research work, on the basis of which thermomechanical metalworking processes have been developed. By means of these processes, it was possible to produce material of such strength and elasticity that truck leaf-springs made of this material are three times as strong as springs produced by conventional methods.

But the question is: Are we sufficiently equipped for processing such high-strength material? Do we have at our disposal the installations necessary for thermomechanical treatment? Such installations in turn require efficient BMSR [industrial measuring, control and regulating] systems, including computers and robots. Problems of this kind are best solved--and this is indicative of the need for cooperation between research and production--through joint efforts based on long-term, stable development conceptions comprising all phases from basic research to production. The present combines are much better equipped in this regard.

[Question] But it is painful to be told--and here we are again referring to your statements of June 1979--that on the one hand there are high-level research results that for various reasons are not utilized and that on the other hand partners of the Academy are in need of results that presently are not yet available.

[Answer] I said at the beginning that we have made some progress. Nobody claims that the problems mentioned have been completely solved. And I should add the following: If an extensive and long-term conformity of research work and social requirements is to be insured, the Academy must establish a scientific lead and make available a reservoir of knowledge, findings, experience and methods, which researchers, designers and technologists in industry and other fields can draw on in their work. The greatest benefit will be derived in those sectors of the economy, which themselves undertake basic research. A focal point of the research work is the effort to raise the level of automation in various fields. This involves the scientific task of converting control problems into computer programs.

[Question] In regard to machinery, this will increase productivity and exports, since the materials can be processed more efficiently....

[Answer] Yes. The cooperation between institutes of the Academy and industrial combines and enterprises will produce scientifically-technologically significant results and tangible economic effects, if ambitious, long-term objectives are derived from the constant observation of the international development trends in research and production. On this basis, there has developed a close, comradely cooperation, the main driving force of which is the common interest in the timely solution of problems. Generally speaking, it is necessary to produce maximum results in crucial sectors of the national economy.

These principles have been taken into consideration in the 1980 plan of the GDR Academy of Sciences.

West German Commentary

Bonn IWE-TAGESDIENST in German No 23, 11 Feb 80 p 2

[Report from Berlin: "GDR Academy of Sciences to Undertake More Basic Research." A translation of the East Berlin SPECTRUM interview referred to below follows this commentary]

[Text] In the future, the GDR Academy of Sciences is to engage on a larger scale in long-term basic research instead of pursuing--as is presently largely the case--short-term research projects for the industrial sector. This opinion was advanced by Prof Ulrich Hofmann, vice president of the Academy of Sciences. Hofmann stated that there is a number of fields in which the scientific progress made is considered unsatisfactory; if scientific solutions to economic problems are sought only after these problems are presented to the scientists, the loss of impetus is bound to be considerable. (SPECTRUM 1/80)

Need for 'Reservoir' of Scientific Findings

East Berlin SPECTRUM in German Vol 11 No 1, Jan 80 pp 2-5

[Interview with Prof Dr Ulrich Hofmann, vice president, GDR Academy of Sciences, recorded by Hildegard Hesse: "A Program With Far-Reaching Goals"]

[Text] [Question] We would like to start with a question which refers to the meeting between the president and the directors of the institutes and institutions of the Academy of Sciences in September of last year. During this discussion, appreciative as well as critical statements were made about the activities and findings of the Academy. Could you tell us about some of the conclusions drawn--especially in regard to the solution of problems in 1980?

[Answer] According to numerous comments, the meeting with the president met with favorable response on the part of the directors and scientists of the institutes and it has given rise to a goal-oriented movement. This is understandable; for at this conference, which we must regard as the logical continuation of the implementation of the resolutions adopted at our conference of kreis [GDR administrative unit] deputies, an unequivocal stand was taken on the results achieved and on those problems that we must solve in order to make an effective contribution to the development of our socialist state. The conference established guidelines suggesting--without any intent of finality--ways of defining, implementing and--if need be--correcting the projects at hand. In order fully to understand the objectives of this conference, one must take into consideration the political, economic and scientific requirements, which were defined at the 11th session of the SED Central Committee and which we are now confronted with.

A crucial factor of intensification in general and of intensification in science and technology in particular is the timely elaboration of the correct objectives. In this elaboration, two conditions must be met: The objectives must correspond to the most advanced international standard of scientific development and to the concrete conditions of the economic development of our country. In this respect, the point is not to find the practicable, but rather skillfully to select the necessary from the mass of possibilities. As scientists, we are obliged to make the comparisons with modern science already at the stage of reflection about the goals and tasks, the ways and methods, and the pace to be adopted. The definition of objectives and problems is a creative process--the first phase of scientific work, as it were--and in social terms, this evaluation is correct. It is precisely from this point of view that the activity of leading scientists must be viewed. For it is they who must determine the present, and even more so, the future scientific makeup of the Academy's institutions and thus of the Academy of Sciences as a whole. This is a complex problem, the solution of which is a continuing process and which calls for sound scientific and social judgment on the part of each supervisor.

The political and technical activities of the Academy's scientists are reflected in the 1980 plan, which is distinguished by a number of advances. Above all, there are improved guidelines concerning the solution of basic scientific problems in fields such as mathematics, physics and the biosciences. In addition, the contributions in support of maximum performance in industry--including the efforts to promote the development of microelectronics and to secure the raw materials base--were extended and improved. Of primary importance in the determination of these tasks was the commitment to implement the extensive resolutions concerning the development of science, which were adopted at the Ninth Party Congress.

Several aspects of the plan, e.g. the targets concerning the development of the energy base and its efficient utilization or the chemical refinement of raw materials, are not yet satisfactory. We must definitely intensify our efforts to increase the export capacity of our economy and to eliminate imports from the non-socialist monetary area. We must make every effort to insure the development of creativity and efficiency beyond the hitherto customary standards.

[Question] Lately, there has been much talk about the search and support for scientific talents, without which there could be no development of science...

[Answer] ...You are quite right. We are proceeding from the assumption that the socialist society has created the conditions--and can create even better ones--that are necessary for the development of scientifically gifted individuals. Frequently, the spotting of especially talented students is the first stage of such promotion. The search for talents is carried out by individuals and must be supported--outside the framework of the school--by competent circles of science and technology.

As is true of other people as well, scientifically gifted individuals who excel in certain fields must strive to develop their total personality. The support measures must not be restricted to the respective field of interest, but must extend to other fields that are essential for the development of the personality. I am thinking here above all of general education. In addition, I regard as important industry, will power, endurance, assertiveness, a sense of responsibility, and the conduct within and vis-a-vis the collective.

These traits cannot be developed through tutoring alone. For the most part, they are developed in crucial tests. The development of talents presupposes a generally high level. However, we must be aware of the fact that if superficiality is to be prevented, great social and individual effort is required in the development of talents. We should take advantage of the superiority of our social system so as to find and wisely develop all talents, for socialism needs the scientific-intellectual powers of its developers.

[Question] What can and must be done by the Academy in regard to the development of scientific talents?

[Answer] We realize that the development of talents is not exclusively the concern of the school. In my opinion, all qualified scientific institutions must cooperate on this task. We must give a lot of leeway to the inquisitiveness of young people so as to develop their own creative learning process. There is no doubt that the experts at the universities and academies bear great responsibility in this regard. However, in the development of talents, it is equally important to insure that they can acquaint themselves with academic and industrial research facilities and with manufacturing plants. This idea occurred to me in connection with the successful work of learning and work collectives.

[Question] For the leading scientists of the Academy, what consequences result from the demand to make use of the maximum development and efficient utilization of the scientific-intellectual powers of the researchers and scientists?

[Answer] Perhaps it is advisable first to compare the various outlays expended on the Academy. The physical assets of the Academy of Sciences--in the form of buildings, installations, equipment, instruments, etc.--presently amount to approximately M 1.5 billion. The social expenditures on the education, training and advanced training of the approximately 20,000 scientists of the Academy of Sciences likewise amount to approximately M 1.5 billion. We need not labor the point that the scientists, i.e. our intellectual-creative potential, represent the most valuable, dynamic and hopeful element. Unfortunately, in practical work this is often insufficiently taken into consideration.

In regard to scientific-technological progress and its acceleration, several factors are of crucial importance: new ideas that are simply essential, novel instruments, equipment and research methods that are more efficient than conventional methods, and novel experimental objects that must be made available. By themselves or in combination with the others, these factors represent starting points for new insights.

[Question] In this connection, a question about the relationship between ideas and the latest scientific equipment: Which of these two elements takes priority? Or is the one inconceivable without the other?

[Answer] It is quite understandable that those, who are engaged primarily in experimental research, who need modern component parts and aggregates, instruments and equipment, are not always satisfied with the supplies presently available. However, it would be totally wrong in this connection to underestimate the diverse possibilities of scientific creativity. I would like to state the problem in this way: For GDR science, and for the Academy of Sciences in particular, it is actually a challenge to be compelled to solve its problems by expanding its scientific-intellectual capacity rather than its material-technological basis.

In addition, one must ask and answer the following questions: How is it that so much time is required for solving problems, developing methods, technical programs, scientific instruments, etc.? Why is there no improvement in the rate of utilization of key basic assets? I am sure that it is not only and not even primarily objective or material factors that account for this. It is imperative that all research institutions be oriented toward maximizing creative work. And we must always keep in mind that ultimately every scientific apparatus is the product of scientific-technological ideas.

At this point, I have to ask myself whether our ideas will always suffice for the development of new scientific instruments and apparatus. According to an analysis prepared from an international point of view, over 75 percent of the modern research technologies originate in scientific laboratories. Interestingly, over 75 percent of the constant improvements in these technologies likewise originate in such laboratories, not in the concerns or enterprises that develop these technologies. The conclusion: Each scientist must make his or her own contribution to the development of an advanced research technology.

[Question] As is well known, new insights originate at the interface of several scientific disciplines. Is it possible deliberately to stimulate--and, above all, to plan--such gains in understanding?

[Answer] It is true: At the interface of several scientific disciplines--and the number of such interfaces has been increasing--new insights are born. At present, many processes of this kind are taking place and I am tempted to say that they are taking place at a higher level of integration.

We need only recall the insights that were generated in molecular biology on account of the interplay between this discipline and physics and chemistry; or the magnificent results produced by space research, which--aside from having yielded new insights--are concerned above all with the solution of complex problems in diverse scientific disciplines.

Coming back to your question as to whether it is theoretically possible to plan new findings: In my opinion, it would be wrong and presumptuous to try to plan such findings. One can establish objectives, but one cannot through planning anticipate insights. To be sure, one can in various ways create or plan favorable conditions that are likely to lead to new discoveries or insights.

Perhaps one can illustrate this by a comparison: Imagine you are asking 400 scientists to produce basic findings. Are you increasing the chances of success, if the 400 scientists are concentrated in a single establishment? Or are fundamental insights more likely to occur, if there are, let us say, 20 collectives--each comprising 20 scientists--which work under different conditions and in different scientific establishments representing different fields and various schools and applying different methods? In my opinion, the first variant offers only slim chances, whereas the second variant appears to be much more promising. It is clear that in the latter case the breakthrough will occur within that framework which offers the requisite conditions and components.

[Question] The formation of combines affects the Academy's research work as well. Would you be so kind as to comment on that? Are these effects reflected in the 1980 plan?

[Answer] It is highly gratifying--and this also goes for the Academy--that for closed reproduction processes combines have been adapted or newly established. Significantly, these combines possess great research and development potential. However, some scientists have expressed doubts and even the fear that such high-performance units may not leave much work to the Academy. In this regard, I would like to point out the following: Experience and the social requirements have shown that a strong research and development base in the combines is actually prerequisite to a successful cooperation between the Academy and the combines.

However, the objectives of this cooperation are bound to undergo gradual change. I am convinced that our institution will be increasingly oriented toward long-term objectives and tasks, that it will be able to engage in long-term research work on a larger scale. After all, there are quite a few fields--I need only mention immunology or enzymology--in which the scientific progress has been unsatisfactory.

Mindful of the Academy's responsibility, I think it is necessary at this point to emphasize the following: If scientific solutions to economic problems are sought only after these problems have been presented to the scientists, a loss of impetus is bound to occur. But if we succeed in establishing a reservoir of scientific knowledge, findings, experience and methods, which can be used as occasion demands, we will be able to put research findings into practice and at the same time to gain increased impetus. After all, the obligation of science consists in satisfying needs in novel ways, and this in turn gives rise to greater or different needs. The history of mankind offers many examples in this respect, and we should continue--in keeping with the farsighted demands raised in the SED Program—to break new ground, to develop science in all of its complexity in the interest of our country's social progress.

(SPECTRUM is grateful to Vice-President Prof Dr Ulrich Hofmann for this instructive interview, for it shows that basic research is very important for the development of our society and that in the formulation of the research objectives this social mandate must be taken into account. In the future, our journal will discuss more extensively problems of this kind.)

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HEAD OF METEOROLOGICAL SERVICE DEPICTS STATE OF THE ART

Budapest MAGYAR TUDOMANY in Hungarian No 1, Jan 80 pp 12-21

[Article by Rudolf Czelnai, corresponding academician, president of the National Meteorological Service]

[Text] The Domestic Research Base

Meteorology is not one of the traditionally featured branches of science in Hungary. Before the liberation [end of World War II], the conditions for organized and systematic meteorological research were lacking. Although the Meteorologiai Intezet [Institute of Meteorology], established in 1870, grew intensively between 1890 and 1914, the prerequisites of development ceased to exist before research bases suitable for research at the international level could be started owing to unfortunate developments in the external conditions. There was no longer a possibility during the twenties and thirties. (It should be noted in this connection that a quite intensive, high-level science-propagation effort was carried out precisely during this period.)

The conditions for starting organized meteorological research became available only during the mid-fifties. However, the work that was started matched foreign examples and was not oriented toward domestic needs. Fundamental research projects were featured during the first period, and relatively many publications noted abroad were generated. Matching the research projects to domestic needs was placed on the agenda during the sixties. This development manifested itself by the fact that applied research and utilization studies started to predominate over fundamental research.

Parallel to this development, the earstwhile Orszagos Meteorologiai Intezet [National Institute of Meteorology] became the Orszagos Meteorologiai Szolgalat [National Meteorological Service] in 1970. This, of course, expressed the predominance of services.

The rapidly increasing needs of society strongly promoted the development of services from the sixties onward; however, they generally did not affect favorably the establishment of the basic conditions of research, especially in the services sector and during the initial stages. The reason for this was that personnel was attracted away from research. The new application projects later suggested new projects of fundamental research, and it was this factor which significantly contributed to the growth of training and advanced training of experts. It is generally acknowledged today that meteorological service, research, and training represents an organic whole, and none can be advanced without the others. The OMSZ [Orszagos Meteorologiai Szolgalat; National Meteorological Service] developed in cooperation with the Department of Meteorology of the ELTE [Eotvos Lorand Tudomanyegyetem; Eotvos Lorand University of Sciences] a major training program, which also includes post-graduate training. This program will make it possible to substantially strengthen the research base of meteorology within a few years.

The following summary describes the nature and tasks of the research establishments in our branch of science:

Kozponti Meteorologiai Intezet [Central Institute of Meteorology](OMSZ)

The task of this institute is the maintenance, development, and upgrading of the network for systematic observation of atmospheric phenomena and events; the collection, processing, and filing of the results of the observations; the performance of research and development of information concerning meteorological data for economic decisions; the study and modeling of atmospheric transport processes; study of the climate; and investigation of methods for long-range forecasting.

Kozponti Legkorfizikai Intezet [Central Institute of Atmospheric Physics] (OMSZ)

The task of this institute is to carry out fundamental and applied research and development in the fields of atmospheric physics and atmospheric chemistry. It also carries out applied research and development in the field of agrometeorology. For these tasks it maintains special measuring facilities, experimental laboratories, and observatories, and also carries out measuring expeditions. It is the basic institute for cosmic meteorological research and atmospheric-chemical research associated with air purity, carried out within the INTERKOZMOS framework.

Kozponti Elorejelzo Intezet [Central Institute of Forecasting](OMSZ)

The task of this institute is to process systematic domestic and foreign observation data concerning atmospheric phenomena and processes with the aim of developing short-range and medium-range general and special forecasts (for example to agricultural, air-traffic, and water-management interests), to issue advance warnings about meteorological and weather hazards, to issue systematic and occasional forecasts for the area of Hungary, and to carry out studies aimed at improving ultrashort, short-range, and medium-range forecasting.

Alkalmazott Felhofizikai Foosztaly [Applied Cloud Physics Main Department] (OMSZ, Pecs)

This institution operates the first domestic rocket facility against hailstorms. In addition, it is the research and training base of the methodological advancement and domestic implementation of techniques aimed at preventing hailstorms.

ELTE Meteorologiai Tanszek [Department of Meteorology at ELTE](OM [Ministry of Education])

The research tasks of this institution are the interactions between surface and atmosphere, and the economic utilization of climatological resources.

JATE Eghajlati Intezet [Institute of Climatology at Jozsef Attila University of Sciences](OM, Szeged).

This institute carries out general climatological, urban-climatological and microclimatological studies (the latter primarily related to individual crops).

KLTE Meteorologiai Tanszek [Department of Meteorology at Kossuth Lajos University of Sciences](OM, Debrecen)

This institution carries out complex terrain-climatological and bioclimatological applied studies.

Agrartudomanyi Egyetem Novenytermesztesi Tanszek [Department of Plant Growing at the University of Agricultural Sciences](MEM [Ministry of Agriculture and Food], Debrecen)

Studies concerning agricultural regionalization, plant protection, and melioration are carried out at the Agrometeorological Kutato Obszervatorium [Agricultural Research Observatory] of this institution.

In addition to the OMSZ, OM, and MEM research establishments listed above, studies related to meteorology are also carried out in some further research institutions (ORFI [National Institute of Rheumatism and Curative Spas], VITUKI [Scientific Research Institute on Water Resources], MTA [Hungarian Academy of Sciences] Foldrajztudomanyi Kutato Intezete [Research Institute of Geographic Sciences of the MTA], Magyar Allami Foldtani Intezet [Hungarian State Institute of Geology], Godolloi Agrartudomanyi Egyetem [University of Agricultural Sciences, Godollo], various institutions affiliated with the MEM, KOJAL's [Public Health and Medical Clinics for Contagious Diseases] affliliated with the EUM [Ministry of Health] and so forth.

The scientific and social needs imposed on our branch of science may be summarized as follows:

a) The most important thing is to provide the scientific basis and technological know-how for proper meteorological services. The needs of society in this connection are directly service-related; thus, the research tasks must be derived from the operative tasks.

b) Secondly, we must make sure that those research tasks are carried out which are interdisciplinary in their character and which involve social needs in other branches of science (for example agriculture and engineering).

c) Thirdly, we must make sure that we have the means of monitoring foreign developments in the field of meteorology to such an extent that the needs of modern training, high-quality information dissemination, and public education can be properly met.

d) Beyond the above basic needs, we should, to the extent practicable, support studies which may hopefully lead to new research achievements at the international level. Some risk must be regarded as inherent in this endeavor.

Starting from the needs of society, we may classify the tasks of meteorological research according to the following main groups:

a) Matters concerning optimum adaptation to climatic factors of atmospheric and solar origin (this group of themes includes development of meteorological forecasts and specialization of these, development of so-called decision-making strategies for specific groups of users, systematic evaluation of climatic and meteorological factors and utilizing them for economic planning, and so forth);

b) Matters concerning the direct utilization of atmospheric and solar energy resources (solar energy, wind energy, and so forth);

c) Matters concerning active modification of climatic and meteorological factors (hailstorm prevention, precipitation increasing, frost protection, fog dissipation, microclimate modifications, and so forth);

d) Means of protection against environmental climatic and meteorological factors beyond the foregoing;

e) Studies aimed at the development of basic meteorological systems contribute toward the research/development themes required for the operation of observation, communication, and data-processing facilities for all meteorological activities.

Obviously, these tasks are connected in several ways to the exploration and exploitation of the natural resources of our country, meaning the main areas of endeavor of the OTTKT [National Long-Range Scientific Plan].

Evaluation of the Accomplishments of the Research Network

The funds allocated to fundamental research, applied research, and development during the last five-year plan period, both in terms of personnel and expenditures, changed as follows: fundamental research from 40 percent to less than 20 percent, applied research remained close to 40 percent, and development studies from 20 percent to 40 percent. These ratios largely conform to the social expectations; however, the main requirement is in all three fields to promote research in fundamental and applied studies wherever they contribute to growth. The major obstacle here is the lack of adequate supply of specialists. Radical change is expected after 1983.

The following were the main achievements of domestic research during the last five-year period:

- Internationally acclaimed results were generated primarily in the field of atmospheric chemistry research. As a result, the OMSZ Kozponti Legkorfizikai Intezete is an institution watched on a worldwide basis. The World Meteorological Organization charged this institute with the task of handling matters concerning a specialized international training center on atmospheric background contamination. Many papers dealing with research achievements in this field were published in leading foreign journals. A monograph is presently being published by Elsevier.

- Systematic and intensive research is carried out in the field of continuous development of meteorological forecasting in two institutions of the OMSZ. Special mention may be made from among these studies of the achievements in the adaptation of East-German methods of interpretation and introduction of new experimental methods for quantitative precipitation forecasting (1978).

- In connection with the achievements in the field of domestic cloud and ice formation, a start was made in the area of Pecs on prevention of hailstorms with rockets (based on adapted Soviet technology). This started in 1976, and after three years of experimental operation not only were all investment and operating expenses recovered, but a net profit of 175 million forints was actually realized (based on data from the Allami Biztosito [State Insurance Organization])(Figs. 1 and 2).

- Pioneering work was carried out jointly by Hungarian and Soviet researchers over about 10 years on the study of the statistical structure of meteorological fields. This work is of international importance, and its usefulness may be assessed by the fact that the methods developed were widely used in the objective analysis of meteorological fields, in the designing of observational networks, and so forth.

- International acclaim was also given to studies aimed at elucidating the radiation balance of the surface and the atmosphere with the aid of data originating from artificial meteorological satellites. The aim of the studies was the preparation of the radiation and thermal balance atlas of Hungary, which is an important factor in domestic energy resource research. The methodology developed by our researchers for such studies was described in foreign publications (Fig. 3).

- In connection with the national research theme "Complex Study of Soil Resource Management" heat- and water-balance studies were carried out. These studies yielded practical results of great usefulness in the fields of irrigation standards, optimum fertilizer utilization, and crop yield, and relationships between these. The achievements in the field of the agrometeorology of the radiation, heat, and water needs of basic crops permitted us, among others, to obtain on behalf of the OMSZ the assignment of coordinating a complex integrated preserve production management system on a computerized basis (the assignment came from the OMFB [National Technical Development Committee].

- Our researchers performed pioneering work in recent years in the field of charting the economic effectiveness of meteorological services on an international scale. Switzerland, Hungaria, Tunisia, and Tanzania participated on this work, and Hungarian researchers performed the surveys in Tanzania. The results will be summed up by the World Meteorological Organization.

- Our researchers developed a so-called "transmission model" and a method for the determination of the propagation and spatial distribution of atmospheric contaminants originating from point-like sources and regional sources. The great practical importance of the method is illustrated by the fact that computations based on it are required now for all major domestic investment project.

- Our agrometeorologists developed a crop-estimating method, and introduced a systematic service based on it.

- Work on the establishment of the National Atmospheric Hazard Alerting and Warning System started on the basis of achievements in the field of studies on the meso-scale structure of the atmosphere.

In addition to the foregoing, we could list many projects, primarily forming parts of major themes, which are also of international interest. These research projects, incorporated in broad international programs, gave much international appreciation to our scientists. Success in such matters is illustrated by the fact that there was a major increase in the role of Hungarian researchers in many areas of international cooperation.

The major domestic meteorological research results are published in the IDOJARAS journal (often in foreign languages). This journal is well known internationally. Foreign authors regularly cite its publications. In recent years we promote efforts aimed at placing articles by our researchers in major foreign journals.

In addition, there are many publications dealing with the references and texts of research results ("Beszamolok" [abstracts], "Meteorologiai Tanulmanyok" [meteorological reviews], "OMSZ kisebb kiadvanyai" [minor OMSZ publications], "Magyarorszag eghajlata" [the climate of Hungary], and similar series). The yearbooks of the OMSZ (three volumes per year) publish the most important meteorological data. Its monthly reports, daily reports, and other special publications are also of major importance.

The journal entitled LEGKOR [The Atmosphere] serves to disseminate relevant information within the Meteorologiai Tarsasag [Meteorological Association] and the OMSZ.

A representative forum for the domestic presentation of our research results is provided by the Meteorological Scientific Colloquia held annually by the Meteorological Scientific Committee of Department 10 of the MTA. The colloquia generally last 1-1/2 days, and deal with a major theme of research (for example numerical modeling of atmospheric processes, meteorological resource exploration, and meteorological forecasts). The wide interest in these events is illustrated by the fact that representatives from other related disciplines also participate. In addition, each researcher of the OMSZ is obligated to report about his scientific results at so-called "sectional sessions." Professional debates follow these presentations.

The dissemination of scientific information is important to ensure that the broad masses of society upgrade their natural-scientific understanding and approach. This is of particular interest in the field of meteorology, since we all know that as soon as the dissemination of proper scientific information slackens, pseudo-scientific information begins to proliferate in its stead, sometimes with the unintended connivance of the press and other mass-communications media. We must regretfully confess that we were unable to devote sufficient attention to the dissemination of meteorological information in recent years (because we were overburdened with other work). Now, however, we see the consequences and will try to remedy the situation. A major aspect of this endeavor, in our judgment, is that we must provide moral and material incentives for this work from our institutional funds since the author's fees are not very attractive.

The Status of Training

Training is a key aspect of the growth of meteorological science in Hungary. Presently, growth is stymied because there was a lack in the supply of new experts in past years. The numerical data may be misleading to some degree. The fact is that since many decades there were meteorological departments in three universities (ELTE, JATE, and KLTE). But training leading to a degree in meteorology was inoperative for 20 years at the Budapest university, which supplied the bulk of the new researchers, and relevant training was given only in the field of so-called complex geology or physics. his practice was unsuitable for the growing needs, and it failed to provide new experts. It was neither continuous nor systematic, nor was the curriculum up to date. As a result, we could not even provide the minimum recommended

Fig. 1. Radar equipment of the hailstorm-preventing center on Tenkes-hegy [mountain]

Fig. 2. Launching an anti-hailstorm rocket

Fig. 3. Picture taken by the Soviet satellite Meteor-29 on 11 September 1979

[Illustrations not reproduced]

training level proposed by the World Meteorological Organization for developing countries. We therefore made the necessary surveys and preparations, and completed a proposal for the introduction of a separate training system for meteorologists. Training has indeed started, on the basis of this proposal, in 1978 at the ELTE. The first classes had 10-15 students. This program will ensure the supply of experts over the long range. The basis of the new curriculum is the subject complement proposed by the World Meteorological Organization; however, by using the high-quality educational traditions of the country, as well as as a result of the analysis of the development trends of the meteorological sciences, we will have a much more sophisticated training program.The new curriculum is concentrated on strong basic training; specialization is relegated to the postgraduate phase of training. It should be noted that several countries are interested in the re-started university meteorologist training in Hungary (primarily developing countries).

The training profile at JATE and KLTE is being developed simultaneously with the newly introduced form of training at the Department of Meteorology of ELTE, as is the modernization of the curriculum with the aim of meeting the practical needs. Publication of textbooks in the Hungarian language is a sorely felt gap, which makes university training even more difficult. A most welcome trend is evident here too. Some badly needed books are scheduled for publication soon by the Academic Press and the Textbook Publishing Enterprise.

There is also a need for the modernization of the high-school curricula for better dissemination of knowledge about the branch of science and for allowing such knowledge to contribute better to the development of general public opinion.

Domestic Relationships of Our Branch of Science

In the field of fundamental meteorological research, the domestic relationships are decisively determined by the tasks of the OTTKT, as well as certain inderdisciplinary international cooperation programs (such as the INTERKOZMOS and the environmental-protection and environmental-development joint projects of the CEMA and the JSZSZK [expansion unknown]). In this area, the relationship with such branches of science as mathematics, physics (geophysics), chemistry, and biology is the most important. There are specific research cooperation agreements with the OMSZ on the one hand, and the MTA Matematikai Kutatointezete [MTA Mathematics Research Institute] and the Orvostudomanyi Egyetem [University of Medical Sciences]. Actual collaboration is even more broadly based, however.

Relationships based on agreements were also established in the field of technical meteorology and related development studies in various areas, involving various communications-engineering, automation, and computer-technological institutions (such as the Postakiserleti Intezet [Research Institute of the Postal Service], TAKI [Communications Research Institute, MTA, SZTAKI [Research Institute of Computer Technology and Automation], SZKI [Computer-Technology Coordinating Institute], institutes of the BMI [Budapest Technical University], KFKI [Central Physics Research Institute], and so forth.

Finally, we mention that interdisciplinary relationships have a great tradition in the various fields of applied meteorology. These relationships are particularly strong and dynamically growing with the agricultural sciences. This is evident since the potential benefit of the use of meteorological science and services is in the order of magnitude of several billions [of forints] in the agricultural sector. The strength of this relationship is illustrated by the fact that certain observatories of the OMSZ (those in Szarvas, Kecskemet, Martonvasar) were set up at the sites of agricultural research institutions or in close relationship to them. The research cooperation agreements with Godollo University of Agricultural Sciences, the Orszagos Novenyvedelmi Kozpont [National Plant-Protection Center], the Ontozesi Kutatointezet [Irrigation Research Institute] in Szarvas, and so forth, have established the foundation of long-range joint effort. The OMFB [National Technical Development Committee] target program for the establishment of a programmed production and processing system, developed in cooperation with the Nyiregyhazi Konzervgyar [Preserve Factory in Nyiregyhaza] is coordinated by the OMSZ, which cooperates with 11 agricultural research institutes in connection with this project.

The tasks of meteorological services for military and civil aviation, general and private aviation, and the like are laid down in detailed and precisely formulated agreements. These agreements indirectly also designate those directions where fundamental, applied, and development studies need to be carried out with the aim of improving these meteorological services.

The relationships with water-management affairs are also close. Specifically, the cooperation with the VITUKI [Scientific Research Institute for Water Affairs] and the Vizgazdalkodasi Intezet [Water-Management Institute] of the OVH [National Bureau of Water Conservation] are particularly varied. Two meteorologists are active in the committee handling the MTA-OVH coordination on water management at a high level.

Advance can also be reported in recent years in the area of special meteorological services for mining. As an experiment, the OMSZ introduced the forecasting of meteorological conditions which represent a special hazard in connection with sudden mine-atmosphere explosions. This is a good example to illustrate the broad and expanding spectrum of the services.

Of course, a review such as this cannot be complete. But it is important to stress that the interdisciplinary relationships of meteorological research will broaden further in connection with the "Exploration and Exploitation of the Nation's Natural Energy Resources," which is a featured research subject. In this connection, the cooperation with the MTA Foldrajztudomanyi Kutatointezete [Research Institute of Geographic Sciences of the MTA] is very welcome.

Finally, we may also mention that there is broad domestic cooperation in the field of training in disciplines related to meteorology. The research bases affiliated with the OMSZ cooperate closely with university departments. The cooperation with the ELTE Meteorologiai Tanszeke [Department of Meteorology at ELTE] includes the provision of some faculty members.

International Relations

The framework of the international relations of our branch of science is determined by the following international bodies and agreements:

- World Meteorological Organization (WMO, intergovernmental);
- Joint Global Atmospheric Research Program of the WMO and the ICSU;
- The International Training Center for Environmental Protection of the WMO and the UNEP, located in Budapest;

- Regularly scheduled conferences of the heads of the meteorological services of the socialist countries;
- Intergovernmental space project of socialist countries (INTERKOZMOS);
- The IAMAP and the COSPAR, affiliated with the ICSU;
- Joint program of the CEMA and JSZSZK countries in the field of environmental protection and environmental development;
- The European Economic Committee (EGB);
- Cooperation of the academies of sciences of the socialist countries in planetary geophysical studies (KAPG);
- Bilateral agreements between the meteorological services and departments of meteorological sciences of various countries.

The World Meteorological Organization, the guiding body of meteorological activities over the world, organizes and directs the World Weather Watch (WWW) system by using the most advanced technical equipment. The Hungarian service meticulously fulfills all its obligations to this world body. The chairman of the OMSZ participates in the leadership of the organization as a member of the Executive Committee and as the head of the European Regional Committee.

The World Meteorological Organization and the International Council of Scientific Associations (ICSU) jointly established the so-called "Global Atmospheric Research Program (GARP). The Hungarian Meteorological Service started to participate in the activities of the GARP in 1975. The MTA Meteorologiai Bizottsage [Meteorological Committee of the MTA] established a separate subcommittee for the organization and coordination of the Hungarian GARP activities. Several Hungarian researchers took part in the first GARP experimental projects: they served on Soviet research vessels, participated in the activities of the centers in Geneva and Stockholm, and so forth.

The WMO and the UNEP established in Budapest an international environmental-protection training center. The center operates at the OMSZ Kozponti Legkorfizikai Intezete [Central Atmospheric Physics Institute of the OMSZ].

The conferences of the heads of the meteorological services of the socialist countries serve the goal of coordinating the specific and variegated cooperative projects. At these conferences, the meteorological services of the socialist countries also established a joint research program, which is guided by a permanent working committee. The chairmanship of this body is handled—to the satisfaction of all concerned—by a Hungarian scientist.

In addition to the institutions affiliated with the OMSZ, the Department of Meteorology of the ELTE also participates in the organized research activities within the joint space project of the socialist countries (INTERKOZMOS).

Hungarian meteorologists participate actively in the Atmospheric Chemistry Committee, Cloud Physics Committee, and Atmospheric Electricity Committee of the International Association for Meteorology and Atmospheric Physics (IAMAP). The secretary of the Cloud Physics Committee is Erno Meszaros, director of the KFKI. A Hungarian researcher also works with the COSPAR (Space Research Committee).

Meteorological studies are required in connection with two subjects in the environmental-protection and environmental-development programs of the CEMA countries and the JSZSZK: "Meteorological Aspects of Atmospheric Contamination" and "Global Environmental Monitoring System."

The first deputy president of the Atmospheric Purity Working Group of the European Economic Committee (EGB), serving in the executive body of the team guiding studies on long-distance atmospheric contaminant transport, is Dezso Szepesi, department head of the OMSZ.

In addition to the OMSZ, the departments of meteorology of the ELTE and the JATE also participate actively in studies set up within the framework of the planetary geophysical cooperation (KAPG) of the academies of sciences of the socialist countries. A Hungarian scientist is the coordinator of the subcommittee responsible for the problems of atmospheric physics and meteorology.

The OMSZ has concluded bilateral scientific cooperation agreements with the Polish People's Republic and the Yugoslav Socialist Federal Republic, specifically with the appropriate institutions of these countries. A similar agreement is scheduled for conclusion soon with the appropriate institution of the Czechoslovak Socialist Federal Republic. In the field of higher training in meteorology, there is a very important cooperation agreement between the Department of Meteorology of the ELTE and the Department of Meteorology of the Zhdanov University in Leningrad. In addition, there is a growing Hungarian-French cooperation in the fields of atmospheric physics and atmospheric chemistry.

To sum up, we may state that Hungarian meteorologists perform important tasks in international bodies.

Expected Development of the Branch of Science

In assessing the expected developments in meteorological science in the decades ahead us and later, we must start out from the fact that now is the first time where it is even possible to think about the study of the complex interactions of the physical processes determining the behavior of the global atmosphere, since only the observational equipment, research techniques, and the potentialities of international scientific cooperation generated by the technical and engineering revolution makes this possible. The basic approach and method for research is the physical and mathematical modeling of the process systems of the atmosphere, and the computerized simulation of these processes. Thus, modeling problems became the key question of the advancement of the meteorological sciences.

The users of the meteorological services are primarily interested in what developments may be expected in the quality, accuracy, information content, and reliability of meteorological forecasts. The following answer may be given to this question:

- There will soon be a major advancement in the field of ultrashort (3-6 hours) forecasts and warnings;
- The information content of short-range (24-36 hours) forecasts will gradually increase, however, the accuracy rate, which is presently 85 percent will increase only slowly (and only at great expense). This follows from the theoretical difficulties and limitations of multivariable, nonlinear forecasting problems;
- The accuracy of medium-range (3-10 days) forecasts is today still inferior to that of the short-range forecasts. It appears that this gap could be narrowed, and that development here is one of the key aspects of development;
- Finally, the possibilities of improving the long-range (more than a month) forecasts are uncertain at the moment; in the decades to come we may be in the position of assessing the potentialities as the so-called "general atmospheric models" improve.

Advancement in cloud-physical and atmospheric-chemical studies is likely to broaden the scope of effective weather-modification interventions (artificial rain generation, hailstorm prevention, fog dissipation, frost protection methods and technologies, and so forth).

Society needs badly the development of medical-meteorological forecasting. Obviously, this factor necessitates close cooperation between the meteorological and medical sciences. Development is presently impeded mainly by the many unanswered scientific problems that still exist. Difficulty is also created by the fact that so far we were unable to formulate sufficient cooperation between meteorologists and physicians for effective progress. The situation, at least insofar as medical-meteorological forecasts is concerned, does not appear to be any better abroad than it is in Hungary. But it is a fact that major studies are underway abroad in this area, and it would pay us to watch them.

Major advancement in climate research is expected on the international level in the decades to come. Preservation of the equilibrium of the climate is a vital matter in view of the economic changes that take place worldwide. A change in the general air circulation would be the worst possible "environmental crisis." To prevent this from happening, we must urgently clarify the potential effects of human activities on the atmosphere. Obviously, this is one of the most difficult questions that science is called upon to answer.

Population growth over the world indicates that the matter of anthropogenic effects may become an important matter by the turn of the millenium. Accordingly, the meteorologists of the world, together with experts from other branches of science and the affected branches of the economy, promulgated a declaration at the "World Climate Conference", held 12-23 February 1979 in Geneva, which asks the countries of the world to do the following:

a) Make better use of existing knowledge on climatic factors;
b) Undertake steps to expand this knowledge significantly;
c) Try and prevent such man-caused potential changes in climate which are potentially harmful to the welfare of mankind.

Beyond this declaration, the "World Climate Conference" debated in detail the plans of the "Climatic World Program" which will be the major enterprise of meteorological sciences between 1981 and 1990, and which closely affects other branches of science also. This program affects in many ways the international programs related to world food supply, as well as the actions initiated for the examination of the energy problem. For example, the World Meteorological Organization intends to contribute to the preparation of the world UN conference scheduled for 1981 on new and renewable energy sources by preparing the overall maps of the solar-energy and wind-energy potential of the world. (It should be mentioned that the Hungarian meteorological service was assigned the compilation of the world solar-energy maps.)

The "Climatic World Program" is a typical interdisciplinary enterprise. In connection with it the World Meteorological Organization requests the meteorological services of all countries to support and stimulate those related scientific institutions and research bodies which have a potential contribution to make to the program. This program will be decisive in the next decade for the development of the meteorological sciences.

International cooperation will become increasingly important if we are to ensure the success of the efforts aimed at solving problems of global implications. Also, participation in research programs guided by major bodies and maximum utilization of the advantages of internationally coordinated division of labor will also become major factors.

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OBJECTIVES OF MEDIUM-TERM SCIENTIFIC RESEARCH PLAN PUBLISHED

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[An article by Lajos Szanto, Candidate of Economic Sciences and director of the Science Organization Group of the Hungarian Academy of Science; titled "An Important Step in The Modernization of Research Planning"]

[Text] Since 1971-72, one of the most important tools of the planned direction of scientific research in our country is the National Long-Term Scientific Research Plan. This important document of the government's science policy contains, on the one hand, the more important principles of the state directives for science and development and affirms, on the other hand, those 18 highly-important scientific tasks that are of paramount importance from the social, economic, cultural, and scientific view. An important portion of our domestic research and development potential is devoted to the seven main research objectives and the 11 research programs that are linked to the basic development trends of the economy, serving our long-range objectives.

Based on the plan, our domestic workers of scientific research and technical development obtained notable results in this five-year plan period. Thus, solid state research, which is important on account of its industrial applications, had outstanding results in alloying aluminum, improving the quality of tungsten filaments of light bulbs, and developing semiconductor light sources. The results pertaining to "Bioregulation" have an orienting effect on domestic biological and biomedicinal research. The Computer Techniques Program was instrumental in uncovering new knowledge and led to domestic computer production and application. In social science research, the tasks of priority are those that uncover the laws of today's social progress. The majority of the results may influence various social and economic decisions.

As of now, the results to increase the planned nature of scientific research and development are far from satisfactory. Alas, the desirable interaction and harmony between the main trends of the social-economic progress and the international collaboration and domestic research has not yet occurred. Even the plans for economic development have only an indirect effect on research and development planning system and the more effective influence of society's needs. One of the exceedingly important and new moves in the modernization of the planning system is the preparation of the 1981-5 National Mid-Range Research and Development Plan. The Council of Ministers ordered, in the spring of 1978, the preparation of national mid-range plans as they relate to the most important research tasks that aim for the development of the economy. The first portion of the large-scale planning work, mobilizing significant powers of the intellect, has been completed at the end of the last year: the concept of the mid-range plan has been laid out.

The document consists of three chapters: summing the subject and the recommendations. It was recently discussed by the Science Policy Committee of the government. The Committee also decided on the tasks to follow. The first chapter describes the science policy principles that are to be realized in the years 1981-1985. The second chapter, the themes, contains the 28 research and development programs which serve, on the Council of Ministers level, the material production directly, to achieve the social-economic goals of the socialist construction. The third chapter reviews the resources (and their ratios) that can be devoted to research and development in the sixth five-year plan period.

Of the programs, more than 20 deal with actions that have direct economic goals. Every one of these programs has great significance in the realization of concrete, mostly industrial and agricultural, goals in our socialist construction. Their realization may guarantee that the results are available at the proper time and add effectively to the development of social practice and material production. Below, we review a few of them.

--The improvement of the technical level of coal enrichment and use is aimed to help the users of coal, improve the efficiency of coal, and expand the circle of coal users. The research is aimed mainly to replace the imported energy carriers (coke, coking coal, hydrocarbons).

--The goals of the industrial technology research, leading to protein production is to find technical means to expand protein production, both for human and animal feedstock, in an economical way. This would gradually decrease protein imports.

--The improvement of cereal production aims to increase the yields of the commonly used strains, improve their production, and development of strains that are based on new genetic forms and adjust well to the extremes of weather.

Of the six programs that are not based directly on economic goals, the following exceed in timeliness:

--the program to renew public education whose goal is to give a scientific basis to decision-making in education policy, to help the long-term strategy of education, to modernize the content and structure of the school system and to increase the schools' effect on society. The research here has to uncover the effects of economic and social changes on education and its institutional types.

--the program, titled "Research into The Formation of A General Socio-Political Concept", aims to produce principles and practical guides that can be used in forming the state's social policy and insure its political unity and principles better than the existing policies.

The programs aim to have a social and economic effect already in the sixth five-year plan period. They also serve as a basis to the seventh five-year plan. The proponents of the programs: ministries, national organs, and scientific bodies counted on obtaining new scientific and technical knowledge that can come through international cooperation, licensing and know-how purchases, and the demands of adaptation. It is hoped that we will be able to renew our earlier practices in making important research and development goals that satisfy society's practices in making important research and development goals that satisfy society's demands.

The high-level review of this OKKFT concept showed several unfavorable features of the work--shortcomings that have to be corrected in the future.

One of the cardinal demands of the OKKFT concept has been that the programs it champions extend to the complete innovation process. Signs point to the fact that this has not been the case. Some of the concepts give only vague answers to the question of practical value of the research. In many cases the ratio of research and development cost to practical payoff is not satisfactory--i.e., the concept's costs are underestimated.

One characteristic feature of the programs is that development seems to have a larger part than the underlying research. In the short run, the determining role of development is correct but a sharp dominance vs. research is incorrect. The correct ratio of research and development costs--although hard to quantitate--deserves great attention because this is a double task in every time period. On the one hand, the concrete satisfaction of social-economic need and on the other, the solution of scientific problems, that serve as a base for future progress and is not necessarily contrete, is of import.

Every research and planning activity must be in close contact with the national economic plan. This requirement has not been sufficiently adhered to in the planning. Work must be strengthened in this respect in the next period of planning by bringing the concrete content of the programs and the economic-political goals closer to each other.

Now that the government's Science Policy Committee decided on the programs, the mid-range concept will be prepared into a detailed plan proposal. It is thought that this stage will last until the end of the year. Then the National Mid-Range Research and Development Plan will be presented to the appropriate scientific and science policy forums in a finished form.

10101
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EFFECT OF RESONATOR PARAMETERS ON THE MODE VOLUME FILLED BY A GAUSSIAN BUNDLE IN GAS LASERS

Budapest KEP ES HANGTECHNIKA in Hungarian Vol 26 No 1, Feb 80 pp 9-12

LUPKOVICS, GABOR, Hungarian Optical Works, Budapest

[Abstract] The output of a gas laser depends on the active length and the geometric parameters of the Gaussian bundle forming in the resonator. Calculations were made (using a program developed for this purpose, run on a Hunor Type 301 minicomputer) to determine the useful mode volume under various resonator parameters. Data on the propagation of the Gaussian bundle and the resonator characteristics were obtained. The major influencing factors are the true mode volume, the maximum bundle diameter at the mirror, and the output divergence. Various configurations were tried by computation, based on the red line of the helium-neon laser. The results are presented in tabular and graphic form. For a given configuration, the mode volume was varied by altering the resonator length, and the intensity was measured, or a planar closure mirror was emplaced at various distances at constant opening-mirror curvature. Based on the results of the computations and confirmatory tests, it was concluded that the intensity ratios tend to decrease with increasing mode volume provided that the radii are relatively large. The importance of the data obtained in designing gas lasers with optimum properties for a given application was discussed. Figures 6; references 2 (Western).

2542
CSO: 2502

UNIFORMITY OF THE EMULSION COATING IN RAW FILMS

Budapest KEP ES HANGTECHNIKA in Hungarian Vol 26 No 1, Feb 80 pp 13-18

GLOETZER, Laszlo and SZABO, Laszlo, Jr, Hungarian Film Laboratory

[Abstract] Complaints were received about alleged sensitometric nonuniformity within batches of ORWOCOLOR PC 12 film made by Wolfen Film Factory State Enterprise (GDR). It was claimed that major contrast and color differences were obtained when changing from one roll to another, originating from the same batch. The Hungarian Film Laboratory conducted comparative tests on the following films: Eastman Color Print Film Type 5381, ORWOCOLOR PC 7, and ORWOCOLOR PC 12. Measured were: relative sensitivity and average gradient, as specified by the Hungarian Film Laboratory. Samples were taken according to a scheme developed for this purpose, disregarding batch start and end specimens wherever they could be identified. The results for the various films tested are presented in graphic form. The ORWOCOLOR types were clearly less uniform than the Eastman films. Although the fluctuations within a roll in the former were generally not very significant, they were very large among the individual rolls, even within a batch. Generally, the red sensitivity decreased from the start of a batch toward the end of the PC 7, whereas the weak point of the PC 12 was the blue sensitivity. Improvements in manufacturing methods and/or materials used are clearly called for, and it was hoped that the problems in the PC 12 are initial difficulties in a relatively new product. Figures 10; references 3 (Hungarian).

2542
CSO: 2502

UDC 621.315.617.4:667.637.232.2(439)

HEAT RESISTANCE OF TITERON 41 IMPREGNATING VARNISH FOR WINDINGS

Budapest ELEKTROTECHNIKA in Hungarian Vol 72 No 7, 1979 pp 189-192
manuscript received Apr 79

MAGYAR, LAURA, Dr, graduate chemist, retired; and GAJDA, JOZSEF, graduate chemical engineer, Department of Product Development, Paint Factory, Tisza Chemical Combine

[Abstract] The TITERON 41 winding-impregnating varnish (alkyd-resin based, with hydroxyl function, compounded with butyletherated resol and melamine resin, thinned with gasoline and aliphatic alcohols) and, for comparison, the XD varnish (similarly formulated) were examined for heat resistance (aging) according to the provisions of IEC Publication 216 and Hungarian Standard (MSZ) 16,950, and the results were evaluated according to the provisions of IEC Publications 216 and 493, and MSZ 16,950/3. The test temperatures were 150, 170 and 190°C, the test period lasted until failure or 12,000 hours (whichever occurred first); and the examinations (carried out in 3-7 day intervals) measured changes in weight, breakthrough voltage, breakthrough field strength, adhesive strength, and the like. Tabulated and graphic data were presented about the changes as a function of elapsed test time. The information developed in the tests indicated clearly that the TITERON 41 has superior heat resistance than the XD varnish (which it was developed to replace). The TITERON 41 meets the heat-resistance requirements for Class "B" (as does the XD), meaning that it can be used to impregnate windings of electrical machines of this class. Figures 3; table 1; references 7: 3 Hungarian and 4 Western.

2542
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UDC 621.313.018.6:537.634

ELECTROMAGNETIC VIBRATIONS OF ROTATING ELECTRICAL MOTORS

Budapest ELEKTROTECHNIKA in Hungarian Vol 72 No 7, 1979 pp 184-188
manuscript received Apr 79

TIMAR PEREGRIN, LASZLO, Dr, graduate electrical engineer, associate professor, Department of Electrical Machines; and BAGI, ISTVAN, graduate mechanical engineer, associate professor, Department of Engineering Mechanics, both at Budapest Technical University

[Abstract] The authors used a newly developed physical model (scheduled for publication in this journal) to investigate the calculation of the effective value of the radial vibration velocity in the stabilized state. They carried out experimental studies to assess the validity of the method of calculation, and determined the value of the transient member of the general solution. Deviations of the actual values from the values obtained with the aid of earlier published methods were examined, and it was judged that the assumption that an electromagnetic force wave with the ordinal number r and a frequency f_r causes only deformations with the ordinal number 4 is not generally valid. The starting inhomogeneous partial differential equation was derived. Solution of the homogeneous portion of this equation yielded the natural frequencies and eigenfunctions of the system. The experimental studies were carried out on a three-phase squirrel-cage asynchronous motor. The agreement between calculated and experimentally determined values was satisfactory. Figure 1; references 13: 4 German, 5 Hungarian, 1 Czechoslovak, 1 Russian and 2 Western.

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UDC: 621.316(497.1

BASIC OUTLINE OF LOAD CONTROL AND JOINT OPERATION OF YUGOSLAV ELECTRIC POWER SYSTEM IN FUTURE

Ljubljana ELEKTROTEHNICKI VESNIK in Serbo-Croatian Vol 46, No 1, Jan-Feb 79 pp 11-17 manuscript received 8 Jan 79

BRKIC, TOMISLAV, and NIKSIC, MIRKO, both of JUGEL [Community of the Yugoslav Electric Power Industry], Belgrade

[Abstract] The basic goals set in designing the system for load control and joint operation of the Yugoslav electric power system were these: 1) combined decentralization of power companies with optimum operation of entire system at minimum cost; 2) optimum organizational structure of load control; and 3) technical equipment required to realize the system adopted. These topics are treated in order. 1) The Yugoslav electric power industry already has what amounts to a pool in that JUGEL exists as the association of the industry, the community's joint load control service has been set up, and an agreement on joint operation is already in effect. The new system will, then, require only adoption of a new agreement to raise the level of coordination. 2) A three-level hierarchical organizational structure is envisaged consisting of the JUGEL load control center, the eight load control centers of the six republics and two autonomous provinces, and regional control centers which will exist in some republics or provinces when needed by the respective load control centers. Levels 1 and 2, then, are basic, and their respective domains and functions are enumerated. 3) From the technical standpoint, there will be two virtually independent technical systems: the operation planning system and the system for real-time conduct of operations. Distinct from these is the telecommunications system which will figure as a unified medium for transmission of information for operational planning, real time processing as well as all other needs of the power industry in the broad sense. Computer configurations for the two functional systems and a brief description of the planned telecommunications system are given. In conclusion, the time estimated to set up the planning system is 3 years after funding has been provided, achievement of the real-time system will require on the order of 6-8 years, and the total cost estimate, assuming price rises while the project is under way, is set at $240 million. Figures 4.

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CSO: 2802

UDC: 620.9(497.12)

PROGRAM FOR CONSTRUCTION OF THE REPUBLIC CENTER FOR ELECTRIC POWER SYSTEM CONTROL IN SLOVENIA

Ljubljana ELEKTROTEHNICKI VESNIK in Serbo-Croatian Vol 46, No 1, Jan-Feb 79 pp 20-22 manuscript received 8 Jan 79

JERKOVIC, BOZIDAR, Maribor EGS [Electric Power Community]

[Abstract] In 1976 the conception of a two-level organizational structure as the basis for control of the republic's electric power system: the republic center for control of the unified power system (RCV) and control subcenters embracing the various regional control centers (OCV) and distribution control centers (DCV). This control structure encompasses all the tasks of monitoring and control from generating sources via all voltage levels to consumers. This two-level republic system represents the second and third levels of the three-level national system. Whereas in that scheme the federal load control center coordinates parallel operation with neighboring countries and operation of the secondary regulation system, and exercises oversight over exchange of power among regions and with neighbors, the RCV ensures optimum operation of the Slovenian unified electric power system by optimizing hydro- and thermal electric production, it oversees and analyzes the reliability of the system's generating capacities, issues commands for switching maneuvers or itself executes them at the levels of 220 and 380 kv, performs tasks as part of the secondary frequency system, and controls the outflow of power, and the control subcenters perform the tasks ordered by the RCV and monitors and controls those parts of the network which the RCV does not operate directly. The OCV are specifically responsible for optimum activity of the chain of hydroplants and constitutes backup should functions fail in the RCV. The DCV performs the tasks of the RCV in balancing load diagrams and in relieving the load should an irregular condition of the unified power system come about. Progress toward setting up this control system in Slovenia power generating and distributing enterprises is detailed. The basic design of the new republic control center has been completed, and a study shows that it can go into operation between 1983 and 1985. Meanwhile the present republic control center will require capital investments to equip it for its functions in the transitional period. The elements involved are supplementation of the system for data transmission to the center, supplemenation of the center's indicator capability for operations management; and hookup of minimal computer configuration for data gathering and processing. There are problems in obtaining equipment from domestic manufacturers which can be solved by cooperation between the power industry and the domestic suppliers as well as among the suppliers themselves. Figure 1.

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UDC: 621.311.22

AUTOMATION OF STEAM GENERATING UNITS

Ljubljana ELEKTROTEHNICKI VESNIK in Serbo-Croatian Vol 46, No 1, Jan-Feb 79 pp 22-26 manuscript received 8 Jan 78

AKERSNIK, FRANC, engineer

[Abstract] The requirements of capability of rapid changes in load and fast hot and warm starts, which must be met by large fossil-fuel steam generating units, especially in the case of plants using low-calorie coal, as in Yugoslavia, depend on proper selection of the boiler and its auxiliary equipment and cannot be achieved by adapting or adding to existing equipment. A system for automatic control of a steam generating block with a capacity of about 300 MW, covering the trapezoidal portion of the load diagram and capable of inclusion in secondary power regulation, is described. Most of the equipment required for the system has already been installed at plants using powdered coal. The design assumes only the range of perfected measuring and regulating procedures and broad-purpose automation both for starting and shutting down the units as well as for achieving the necessary load gradient capability. The control system is based on the principle that power demands simultaneously affect both the boiler and the turbogenerator. Three essential systems, aside from the necessary automatic data processing, are involved: the safety (temperature) system, the system for operating the unit, and the automatic control system. The principles, components and operating steps of the three systems are described. Figures 4.

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CSO: 2802

UDC: 681.3.06:621.311(497.12)

SLOVENIAN POWER INDUSTRY'S CONCEPT OF THE FOUNDATIONS OF A UNIFIED DATA PROCESSING SYSTEM

Ljubljana ELEKTROTEHNICKI VESNIK in Serbo-Croaitan Vol 46, No 1, Jan-Feb 79 pp 26-30 manuscript received 8 Jan 79

BOSNJAK, BRANKO, Maribor EGS [Electric Power Community]

[Abstract] The Slovenian power system has conceived and is building an integrated data processing system to keep pace with the development of the unified control system. Since the activities of the unified Slovenian power system are carried on at two locations, Ljubljana (operations sector) and Maribor (development and investment sector and economic and finance sector), plans call for building two computer centers, each with its own data base, but interconnected so that a portion of the data base of each is accessible to the other. These system data processing centers will rely on the data processing done in regions by regional control centers and distribution control centers, as well as in computer facilities of headquarters of electric power enterprises. Information junctions facilitate the two-way flow of data between the system centers and the regional components. Delineation of the respective functions of these three levels will be defined more precisely after relevant results of a federal study become known. The subsystems of which the Slovenian power system's data processing system will consist are three: 1) operations control, 2) planning, 3) commercial data processing. The subsystems are described in their principal features. Obtaining the necessary equipment will necessitate firm relations between the power industry and the data processing equipment industry. Figures 2.

7045
CSO: 2802

UDC: 621.311.21(497.17)

AUTOMATION AND REMOTE CONTROL OF MACEDONIAN HYDROPLANTS

Ljubljana ELEKTROTEHNICKI VESNIK in Serbo-Croatian Vol 46, No 1, Jan-Feb 79 pp 45-48 manuscript received 8 Jan 79

SKORJAK, BOSTJAN, engineer of Iskra-Automatika, Ljubljana

[Abstract] A representative of the organization designing the control system summarizes the development of hydropower in Macedonia, which has seven hydroplants now in operation and plans to put 11 more on line between 1983 and 1990. Reasons are given for adoption of a three-level hierarchy for automation and remote control of the republic's hydroplants: 1) the generating unit, 2) the hydroplant, 3) the republic load control center (RDC). Principles honored in the design of local automation are given. Provision has been made at every hydroplant for installation of a programmer which will receive and execute the next day's program, compiled and transmitted from the RDC. In addition to this type of program, there will also be programs for direct control of individual plants from the RDC and programs for optimum operation of the individual hydroplants. Six maintenance centers are envisaged to correct breakdowns and perform current maintenance and overhauls. Figures 4; references 5: all Yugoslav.

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